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MILITARY-ECONOMIC PROGRAMS OF THE USSR
1947-61

(ORR Project 10.975)

Office of Research and Reports

CENTRAL INTELLIGENCE AGENCY

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Foreword

This report is the integrated version of the Military Cost Study. It is a composite of Phases I and II, covering the historical and projection periods, respectively, which were informally coordinated with an IAC ad hoc committee. Only such changes in language which were necessitated by bringing together the two phases have been made in this report.

An abstract of this study appeared as Appendix "B" to NIE 11-4-56. Exceptions taken to the study are reflected in the following footnotes, which appeared in the aforementioned appendix:

"The Assistant Chief of Staff, Intelligence, Department of the Army, does not consider the costs derived in the interagency study to be a valid appraisal of the over-all costs of the Soviet military effort and does not concur in the findings of the study. He believes that its basic weakness is a lack of sufficient information, pointing out that few current prices are available for items procured by the Soviet armed forces and arguing that the derivation of prices by the indirect methods employed is too inaccurate." He further believes that the evidence as to whether the armed forces do or do not pay the turn-over tax is not conclusive.³ Lastly, he regards the information available on costs of such important programs as guided missiles, atomic energy, and research and development as almost nil."

"The Director of Naval Intelligence believes that although the text states: (a) the results of this analysis are tentative and subject to error, (b) important gaps remain in statistical data available, particularly in the military sector, and (c) the comparison of the value of defense expenditures in the USSR and the US may be a crude one, the discussion as a whole gives an impression of reliability which is more favorable than the methods and information used can justify. Because of the tenuous nature of much of the evidence used and other important deficiencies in intelligence, he believes that conclusions drawn from this study may not be valid, and that comparisons between USSR and US defense expenditures should be used with caution."

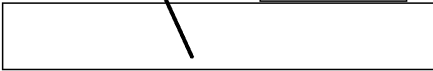
This paper presents primarily the results of the study. With the exception of a small amount of methodological material in the third chapter, neither the specific details of the methodology nor any sources are included. The methodology, however, is included in some detail in the series of appendixes previously published.

Finally, the numerical estimates in this paper have, in general, been rounded to two places. For purposes of calculation, however, an

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additional 1 or 2 places were carried, thereby accounting for apparent differences between components and their respective aggregates as presented. The two places carried should not be construed as significant digits; the degree of significance varies considerably for the several estimates.


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Recapitulation

A survey of this study indicates that the following useful goals have been attained: 1) coverage of estimates of Soviet military expenditures have been extended in depth and detail; 2) a method and a framework capable of assimilating virtually all pertinent considerations and data have been established; 3) a definite advance has been made in the economic measurement of estimated Soviet military programs and in the interpretation of the defense expenditures announced in the Soviet State Budget; and 4) a foundation for the improvement of future estimates has been laid.

Among the advances which permit the improved measurement and interpretation of Soviet military expenditures, the development of internal ruble prices and pay data is perhaps foremost. Information of this kind, covering a major portion of military expenditures as defined, has been established with reasonable accuracy. It has also been determined that the prices the military pays for uniquely military equipment do not cover full cost, because much of the capital cost and overhead are probably not considered in the determination of price. In addition, it seems fairly certain that the announced Soviet defense budget includes most normal military expenditures but excludes such important expenditures as those for research, prototype development, new plant and equipment, and reserves for industrial mobilization as well as those for the nuclear energy establishment.

There are a variety of substantive findings of interest. This study discloses a considerable increase in the estimates of the dollar value of Soviet military efforts. In general, estimates of production of major equipment seem to have been relatively insensitive to shifts in the trend of events and to have been understated in 1952. Operating expenditures, particularly average personnel costs, have been estimated to be higher than previously thought. This valuation of Soviet military

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programs gives an indication of the size and nature of the economic requirements for direct support of these military programs in terms of initial costs and demands upon the various sections of the economy of the USSR. In the aggregate, military manpower estimates seem to be insensitive to, or at least to lag behind, actual developments in the USSR. This insensitivity suggests the necessity of a comprehensive and exhaustive reexamination of Soviet military personnel strength. If feasible, this reexamination should include the civilian personnel of the military establishment as well. The real extent of these excessive estimates tends to be obscured by the gaps in intelligence information on support personnel, equipment, supplies, and services. Consequently, estimates of the physical quantities and expenditures involved had to be conservative. Moreover, the adjusted investment price index probably has moved the derived series too close to the budget series in the early and late years.

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I. Introduction.

A. General.

The genesis of this study lies in the IAC action of 16 August 1955 (IAC-M-208) which approved the recommendation in the post-mortem of NIE 11-3-55, Soviet Capabilities and Probable Soviet Courses of Action Through 1960 that:

"There be initiated as soon as possible a study of the over-all costs of the Soviet military effort and its implication for future trends in the Soviet economy....in an effort to obtain a coordinated appraisal in time to be contributed to the 1956 estimate on the USSR."

Accordingly, on 3 September 1955, the IAC representatives approved terms of reference which detailed the problem as follows:

"To prepare an over-all systematic costing of estimated past and projected Soviet military programs, 1946-1961*, with a view to improving our estimates of: (a) Bloc military expenditures; (b) future Soviet military programs; (c) Soviet economic capabilities to meet these programs; and (d) the impact of such programs on Soviet economic growth."

Although this study is bloc-wide in scope, to attempt to handle the intra-bloc transfer problem, the time allotted did not permit forces other than those of the USSR to be considered uniformly and extensively. Therefore, this publication is limited, except as may be noted, to those regularly active militarized forces which are under the immediate jurisdiction of the USSR, irrespective of location.

Broadly speaking, this study sets out to measure the economic significance of the defense activities of the USSR. Soviet defense expenditures are considered in two groups: those that are direct activities of the Ministry of Defense and are known to be or can with reasonable safety be assumed to be supported from the funds allocated to defense in the consolidated State Budget; and those that are financed from resources originating in budget allocations for other

* Insofar as 1946 was a year of flux because of reconversion activities and demobilization and because the last known change in the rate of pay and allowances occurred in that year, this year was eliminated from this study.

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functions and/or in ministerial funds. By this approach it is hoped to accomplish two ends: (a) to measure the economic impact of the Soviet defense posture as here defined and (b) to gain a relatively detailed appreciation of what portion of the defense effort of the USSR can be covered by its explicit defense expenditures.

Figure I* presents a very generalized picture of the political, administrative and operational control relationships of the Ministry of Defense and its economic support, of the flow of goods from producing to consuming organizations within that ministry, and of the compensating financial flow. Although the indicated organizational structure is more strictly applicable only to the situation since March 1953 when the Ministry of Defense was created, no essential difference in aggregate responsibilities or flows of goods existed under the sometimes separate war and naval ministries prior to that time.

Most simply, the consuming organizations of the Ministry of Defense are formed into military districts (in the USSR), groups of forces (outside the USSR), naval fleets, and long range air armies. These organizations look to the military procurement and supply organizations for material support and to the military financial organization for funds to pay their personnel and to make whatever local purchases they are permitted. The various supply organizations, in turn, arrange for the production and delivery of those particular supply items which are under their cognizance, including whatever construction is required.

To reimburse the producing ministries for the goods and services procured, as well as to supply the military districts and other consuming organizations with pay and other funds, the military financial office has recourse to the Ministry of Finance which supplies from general revenues whatever funds the budget has authorized the Ministry of Defense to expend.

B. Definition of Categories.

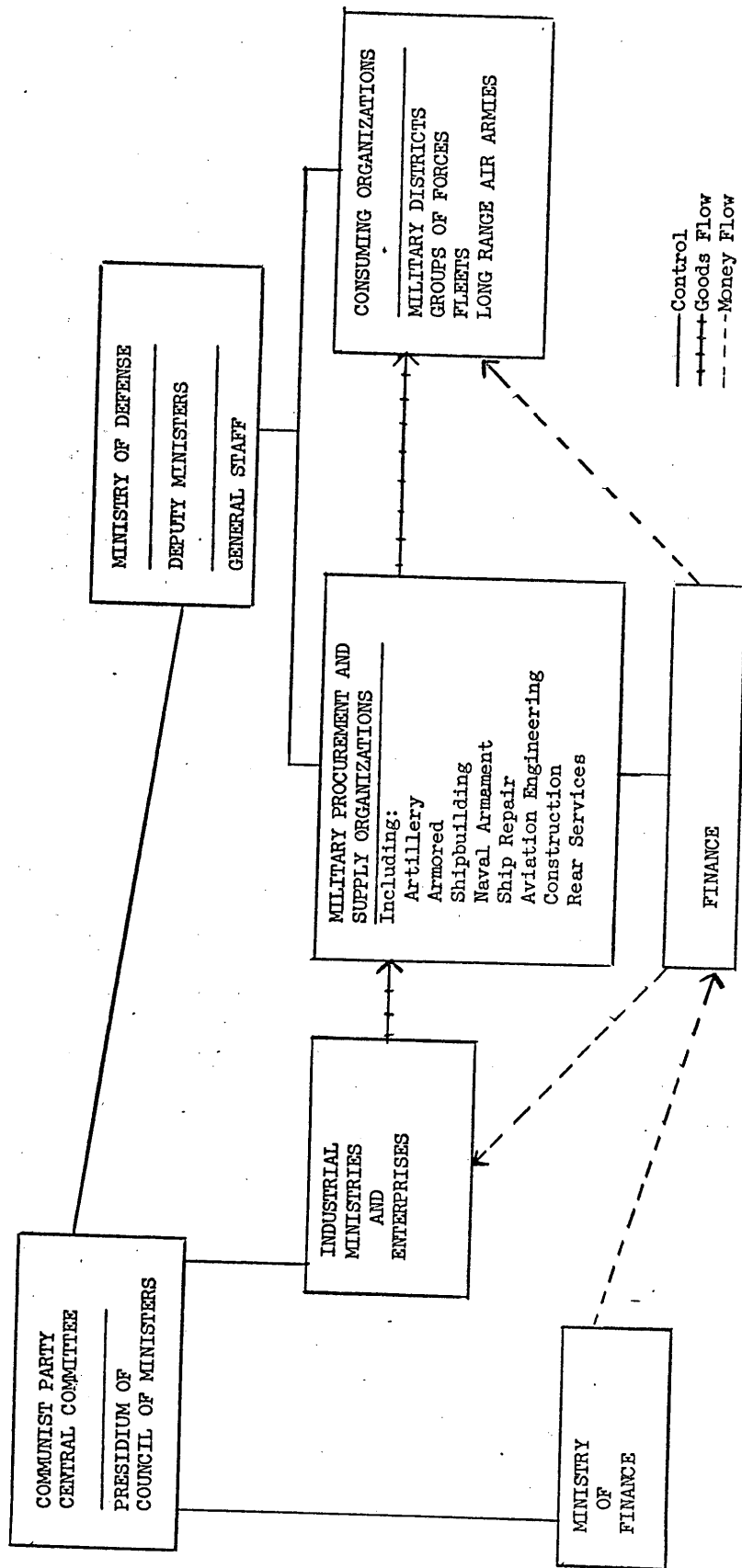
At the outset, it was hoped that this study could be couched strictly

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FIGURE 1
ADMINISTRATIVE AND ECONOMIC RELATIONSHIPS OF THE MINISTRY OF DEFENSE OF THE USSR



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in Soviet institutional terms. At this time, however, it was not possible to do so to any great extent partly because the Soviet institutional arrangement is not known with adequate precision and partly because the available information is not arranged and presented in these terms. For these reasons a synthetic categorization had to be followed in which the over-all defense establishment was broken down into a fivefold classification system of expenditures: those of the ground forces, the naval forces, the air forces, those budgeted to the Ministry of Defense but not allocable to specific forces, and "other" expenditures not budgeted to the Ministry of Defense.

For purposes of computation the Naval Coastal Defense and Infantry forces were included along with the Soviet Army ground forces.

The air forces are defined to include the Air Forces of the Soviet Army, the Fighter Aviation of the Air Defense, the Aviation of Airborne Troops, Naval Aviation and Long Range Aviation. The Civil Air Fleet and Polar Aviation are explicitly excluded in so far as possible.

The naval forces are defined to include surface and subsurface forces and their shore-based support. In addition to Naval Aviation, Coastal Defense, and Naval Infantry, which have been defined as components of the air and ground forces, the merchant fleets,--that is, the River Fleet and the Maritime Fleet including the Fleet of the Northern Sea Route--have been excluded specifically.

The balance of the budgeted funds of the Ministry of Defense covers expenditures which are unallocable to the various forces either due to the present state of knowledge or due to practical considerations arising from the methods by which the estimates of expenditures were obtained. This category covers the guided missiles programs, the Antiair Defense (Protivo-vozdushnaya oborona--PVO) command, control and radar programs, military disability and retirement pensions, and transportation, communications, construction, civilian pay, medical, printing and publishing expenses.

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The last category accounts for activities not financed through the defense budget, including: research and development; the nuclear energy program; the militarized components of the Ministry of Internal Affairs (Ministerstvo Vnutrennikh Del--MVD) and the Committee on State Security (Komitet po Gosudarstvennoy Bezopasnosti--KGB); the Voluntary Society for Cooperation with the Army, Air Force, and Navy (Dobrovolnoye obshchestvo Sodeystviya Armii, Aviatsii, i Flotu--DOSAAF); and the pay of military reserves.

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II. Military Programs and Production.

A. Military Programs

As of the end of World War II any realistic assessment of their military posture by the Soviet leadership would have led to the conclusions

- (1) that on the ground they possessed a relatively large force, well equipped in such essentials as armor and artillery;
- (2) that on the sea they had a miscellaneous collection of relatively short range and/or antiquated vessels;
- (3) that in the air they had forces organized, trained, and equipped primarily for ground support and air defense, and
- (4) that they had no long range air capability or nuclear weapons.

If, then, this same Soviet leadership decided on a policy leading, on an accelerated long-term basis, to the military capability either (a) to overpower, match or seriously interfere with the world's dominant military force, that of the US and its key allies or (b) what is largely the same thing, to dominate the Eurasian continent or the world, the requisite military programs and their priority guides should have been readily apparent. The evolution of these military programs and their priorities can be discerned in the historical composition of Soviet forces as revealed in the order-of-battle (OB) data. These programs seem broadly to have included development of:

- (1) Air defense forces capable of detecting and countering large scale strategic attacks;
- (2) Submarine and other naval forces to interfere with shipping and to defend the seaward margins;
- (3) More mobile and modern ground forces with the adequacy and flexibility of support such forces imply; and
- (4) Long range air delivery systems.

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The salient features of each of these broad programs are reviewed below.

1. Air Defense Forces.

In 1947-48 a new all-metal piston fighter aircraft entered the Soviet OB in quantity, and the first jet-fighter aircraft was introduced into operating units. By 1949 the new piston fighter was in operational units in strength. The piston fighter faded from the OB rather rapidly following 1950, however at that time, jet-fighter aircraft were present in strength and continued to account for an increasingly large proportion of the increasing fighter aircraft forces until 1955, at which time the entire combat fighter strength of the USSR was represented by jet aircraft. In 1955, this group began to develop an all-weather capability as well.

Paralleling these aircraft developments were the introduction of significant quantities of early warning and ground control interception (GCI) radar in about 1950 and of the 100 millimeter(MM) antiaircraft (AA) gun in 1950. This development was followed by a continuous increase in the radar OB and, at the end of the period, by the introduction of the 122 MM AA gun and the guided missile sites around Moscow. At the same time the antiair capabilities of the standard ground combat divisions were increased by the introduction of the 1944 model 85 MM AA gun into the table of organization and equipment (T/OE) of the Soviet line division in 1954. This trend continued with the introduction of the 57 MM AA gun and the multibarrelled 14.5 MM AA machine gun.

2. Sea Defenses

The increase in Soviet surface capabilities for sea defense began slowly after World War II. Except for the prewar-designed OTLICHNYY class destroyer and to some extent the CHAPAYEV class cruiser, the modest increases in strength until 1950 were largely the result of the acquisition of vessels as reparations and of the completion of hulls on which construction had been stopped during the war.

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The Soviet subsurface fleet seems to have increased earlier. By 1948, submarine strength had increased by almost one-third over 1946. This increase, however, was gained primarily through the construction of prewar-designed and, therefore, obsolescent classes of vessels with their attendant limitations.

The marked increase in Soviet capabilities to protect its seaward margins and to interfere with shipping would seem to have begun in 1950 with the introduction of a succession of postwar-designed vessels.

Between 1950 and 1955 the OB received in strength the SKORYY class destroyer, the SVERDLOV cruiser, the KOLA/RIGA classes of destroyer escorts, the "W" and "Z" classes of long range submarines, and the TALLINN and KOTLIN classes of large destroyers.

3. Ground Force Modernization

Indications are that prior to 1947, with the refurbishment of the line divisions, the modernization of the ground forces resulted in increased fire power.

Beginning with 1950, and particularly since 1954, striking power was increased in all the line divisions by substituting heavier caliber tanks and self-propelled guns and/or by increasing the numbers of tanks and guns.

Particularly in the latter half of the period 1950-55, the firepower of these basic divisions was increased in small arms, conventional artillery, rocket launchers, antitank artillery and weapons and, as mentioned above, in antiaircraft artillery and machine guns.

The mobility of these divisions has improved modestly but steadily since 1949 as all-wheel drive trucks of native design were made available in sufficient quantity so as more than to replace the carefully nurtured lend-lease equipment. The mobility of these units received an additional fillip beginning in 1953 by the addition or increase in the number of armored and amphibious vehicles and artillery tractors.

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4. Long Range Air Delivery Systems

The first semblance of a modern Soviet long range air delivery system appeared in 1948 with the advent of the TU-4 (a copy of the B-29) medium piston bomber. This aircraft constituted the only Soviet delivery vehicle with a long range capability until medium and heavy jet bombers were put into operational units in 1954 and 1955, respectively. Production of these bombers had been begun in 1953.

B. Major Military Equipment Production

In general, in the USSR, the availability of major military equipment from production is quite adequate to support the kind and size of estimated military forces in existence during the period.

Perhaps the most striking feature of what must have been a quite deliberate military-economic policy of the USSR is the decision, which apparently was made, to concentrate on a few models of aircraft and naval vessels between 1947 and 1955. A similar course of action seems to have been taken somewhat before this period in the case of ground force equipment.

In 1946, for example, 5 models of fighter aircraft were in series production; by 1950 this figure had been reduced to 3; and in 1952, to only 2. Similar reductions apply to other aircraft categories. In 1946, one model of specialized ground attack plane was in production. Since 1950, there have been none. Three models of light bombers in 1946 have given way to 1 model in 1954 and 1955. For all practical purposes, only one model of medium bomber has been in production at any one time.

A possible reversal of this trend towards standardization, however, seems to have set in. Models of fighters increased to 3 in 1955, and 2 aircraft in the heavy bomber category seem to have shown up virtually simultaneously. In 1951, one model of helicopter was introduced. In 1954, another model of helicopter was added, and both continued in series production through 1955. The concentration of production effort on a relatively few models in 1950-54 probably was influenced by a strong

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desire to obtain quickly a large, relatively high-performance force while every effort was made to develop simultaneously a family of truly modern aircraft.

A similar trend is perceptible in the case of naval construction, primarily in the category of submarines and minor vessels. Whereas in 1946-47 4 classes of submarines with various operational ranges were in production, until the recent introduction of a new medium range submarine, only 2 classes, both long range, have been in production since 1952.

The relationship between estimated military programs and equipment production indicates no clear trends in the reduction of production lead time, in the alteration of reserve policy, or in changes in attrition or wastage experience.

C. Status of Base Facilities, 1947-55.

The base-facility aspects of the military programs of the USSR during 1947-55 constitute a particularly elusive intelligence problem. An airfield expansion program of considerable magnitude has been detected, as has been the provision of numerous possible guided missile launching sites in the vicinity of Moscow. There is some reason to believe that personnel facilities generally have not required significant expansion.

III. Economic Requirements to Support Soviet Military Programs

A. General

This valuation of Soviet Military programs gives a general indication of the size and nature of the economic requirements for direct support of these military programs in terms of overall expenditures, budgeted expenditures, initial and operating expenditures, and demands upon the various sectors of the economy of the USSR.

B. Overall Expenditures, 1947-61.

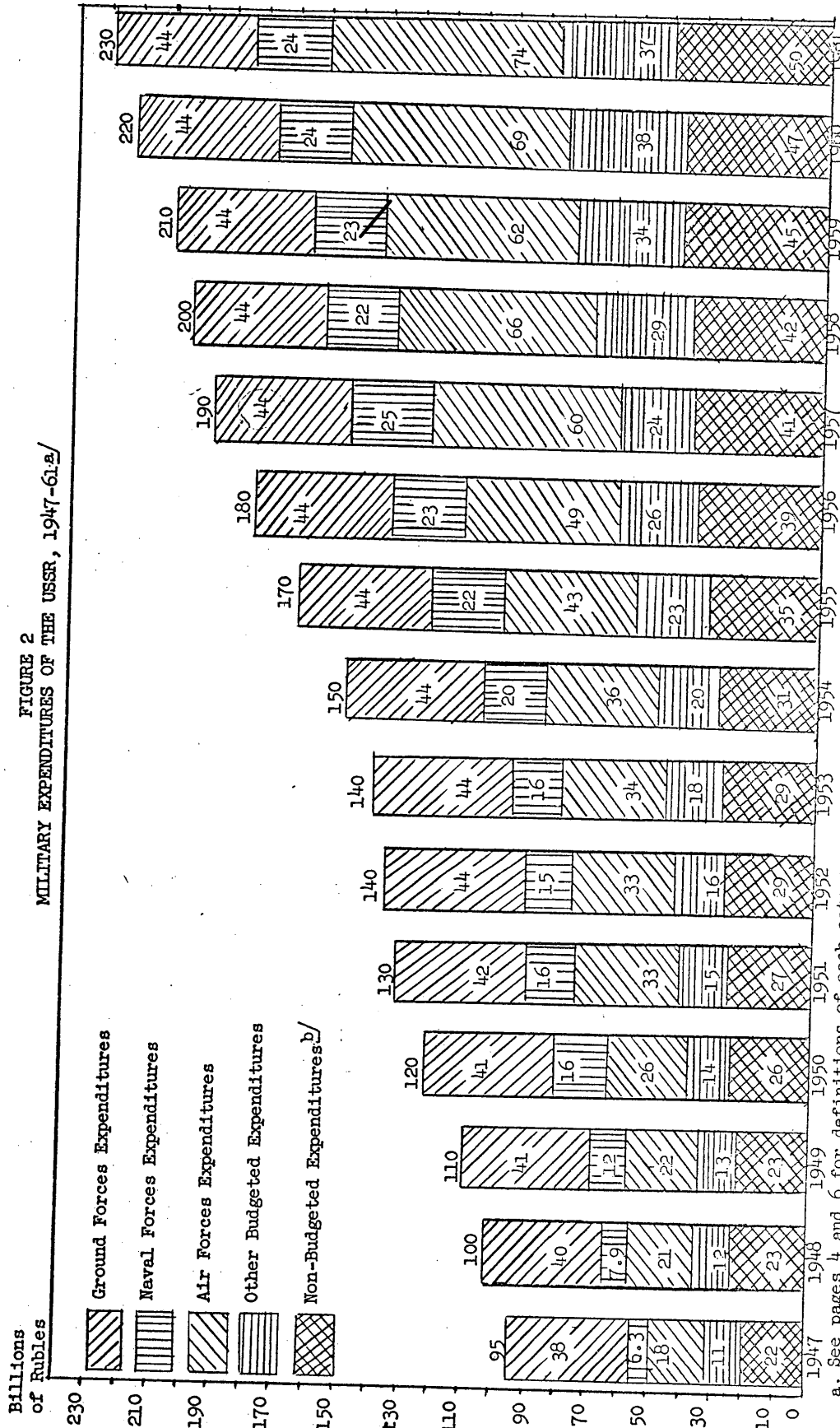
The estimated expenditures for each of the five major categories defined at the end of Chapter I, as well as total expenditures for the Soviet defense establishment, are shown graphically in Figure 2.* Total

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FIGURE 2
MILITARY EXPENDITURES OF THE USSR, 1947-61^a



a. See pages 4 and 6 for definitions of each category.

b. That is, not budgeted to the Ministry of Defense of the USSR

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expenditures to provide for the estimated force levels and their requirements rise from a low of 95 billion rubles* in 1947 to 230 billion rubles in 1961, with the current (1955) value estimated at 168 billion rubles. Expenditures for the air forces exhibit the most marked absolute growth, rising from 18 billion rubles in 1947 to 43 billion rubles in 1955 and 75 billion rubles in 1961. Naval expenditures show the sharpest rate of growth from 1947 to 1955, increasing from 6 billion rubles to 22 billion rubles. In the projection period (1956-61) it is estimated that naval expenditures will remain relatively stable, fluctuating between 22 and 25 billion rubles. Ground forces expenditures are quite constant over the 15-year period starting with a 1947 low of 38 billion rubles and achieving a level of 44 billion rubles in 1952--a figure which is maintained throughout the remaining years of the estimate. Other budgeted expenditures increase from 11 billion rubles in 1947 to slightly more than twice this value in 1955 and to 37 billion rubles in 1961. Other defense expenditures rise some 50 percent from 1947 to 1955, reaching 35 billion rubles in 1955. Further growth during the projection period brings the value of these expenditures to 50 billion rubles in 1961, a value exceeded only by the outlays for the Soviet air forces.

The expenditure calculations in this section are based on a detailed examination of the many Soviet military procurement programs. Outlays for major items of military hardware, for personnel, and for other operating expenses associated with the various weapons systems were estimated in order to provide as comprehensive and detailed a picture as possible of USSR military expenditures. In many cases, internal Soviet data were available for the direct pricing of commodities, for computing expenditures for personnel, or for the establishment of ruble-dollar ratios specifically applicable to analogous information.

* All monetary values in this section (III) are expressed in 1951 rubles.

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It was necessary, when direct prices were unavailable, to ascertain ruble-dollar ratios appropriate to groups of items or specific products in order to reflect differential costs. Ruble-dollar ratios were identified by sectors of origin. These ratios varied between 1.5 and 17 rubles to the dollar (in 1951 monetary values).

No precise measure of the margins of error resulting from the prices utilized is possible. In order to provide some perspective, however, prices may be considered under four major groups for purposes of evaluation. Each group implies a different margin of error and reflects progressively less reliable data, requiring less direct analytical techniques. ¹⁾ The first group utilized direct ruble prices for ascertaining the value estimate, which accounted for 60 percent of total cost in 1950, 48 percent in 1955, and 41 percent in 1961. This group included the following categories: personnel pay; subsistence and clothing; automotive equipment and tractors; petroleum, oil, and lubricants (POL), transportation; construction, miscellaneous services and supplies; civilian wages; pensions; reserves; MVD-KGB personnel costs; and some research and development. ²⁾ The second group utilized a small sample of direct ruble prices to obtain ruble-dollar ratios which facilitated the conversion of analogous price data into rubles. This group, including aircraft, shipbuilding, and armored force vehicles, accounted for about 22 percent of total expenditures in 1950, 27 percent in 1955, and 31 percent in 1961. ³⁾ The third group, accounting for 7 percent of total outlays in 1950, 8 percent in 1955 and 6 percent in 1961, includes the following categories: weapons (principally towed artillery, small arms and mortars), ammunition, electronics, and communications. The valuation procedure for this group presented a mixed situation. The number of direct prices available varied considerably. Ruble price information for electronic equipment is extensive but is primarily for civilian equipment or electronic components. Prices for only a very few weapons and ammunition were available. The best estimated ruble-

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dollar ratios were used with analogous price data to make the value estimate. ⁴⁾ The last group, accounting for 11 percent of total expenditures in 1950, 17 percent in 1955, and 22 percent in 1961, includes guided missiles, atomic energy, some research and development, some equipment spares, and other miscellaneous items. Values were estimated by the use of partial Soviet data and modified US values as factors which were converted to rubles by estimated ruble-dollar ratios. There are either no direct prices or no physical estimates available for estimating the value of this group.

Productivity changes over time were also taken into account to prevent distortion. In the relevant cases, consideration was given to the cost reduction effect of series production. This relationship expresses the declining cost of production as the number of units produced of a given model increases.

The economic requirements in this study are based on intelligence estimates of Soviet military programs. In view of the complexity of the military system and the variety of individual elements therein, it was necessary to prepare the estimate of expenditures in relatively great detail. Rates of utilization of equipment, types of support units, and associated logistic and maintenance requirements were applied at this level of detail. Wherever intelligence data were available on Soviet operating experience and performance and equipment characteristics, these data were used as determinants of expenditure.

In order to reflect changes in weapons systems and in the composition and levels of forces, data on expenditures were organized and accumulated for operating units selected to provide practical, convenient, and representative categories. Not all outlays, however, could be accumulated in this manner, and, as necessary, estimated production for military programs was used to schedule expenditures. In effect, therefore, this study used operating units (order of battle) or production estimates, as appropriate, to phase expenditures for the various military programs.

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Where intelligence did not provide detail for many items associated with the major equipment of the Soviet military forces, it was necessary to relate the schedule of these items to the primary programs. Although every attempt was made to provide as inclusive an estimate as possible of Soviet expenditures on military programs, possible overstatements were avoided by the selection of conservative estimating parameters for many of the categories. In this way the resulting estimates tend to be minima in such instances as construction, communication, transportation, personnel pay and allowances, and subsistence.

1. Budgeted Defense Expenditures

a. General

Throughout the period, 1947-61, budgeted defense expenditures remain slightly less than 80 percent of the total of all military expenditures. The estimated budgeted expenditures are at a low of 74 billion rubles in 1947, reach 130 billion rubles in 1955, and are about 180 billion rubles in 1961. The biggest share of budgeted expenditures in the early years was for personnel, with wages, food, clothing, and miscellaneous costs accounting for some 40 billion to 45 billion rubles annually. While this account remained relatively stable, expenditures for the products of heavy industry were increasing rapidly until, in 1955 and thereafter, these expenditures accounted for more than half of all budgeted expenditures. The impetus for this changing pattern was supplied primarily by the large growth of the Soviet aircraft and the Soviet shipbuilding programs.

b. Budgeted Expenditures for the Soviet Ground Forces

All identifiable and allocable expenditures for the ground forces are summarized in Table 1.* The 1947 level of 38 billion rubles reflects primarily the end of the personnel and industrial demobilization which was occurring in 1946. The years that followed are characterized by a gradual but steady upward trend in expenditures until 1952 when

* Table 1 follows on page 18.

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Table 1
Budgeted Expenditures for the Ground Forces of the USSR, 1947-61

Million 1951 Rubles

	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961
Major equipment procurement	8,600	9,400	11,000	11,000	11,000	13,000	13,000	13,000	13,000	13,000	12,000	12,000	13,000	12,000	13,000
Armored force vehicles	3,000	2,500	3,100	2,800	2,600	2,700	2,600	2,500	2,400	2,700	2,800	2,400	2,500	2,400	2,600
Armored force veh.-init. spares	300	280	420	410	280	310	300	280	280	270	280	240	250	240	260
Weapons	2,300	2,500	2,500	2,700	2,900	3,100	3,300	3,300	3,300	3,000	3,100	2,700	2,700	2,600	2,600
Weapons-initial spares	230	240	250	270	290	310	330	330	330	300	310	270	270	260	260
Ammunition	630	1,800	1,900	2,200	3,300	4,200	4,400	4,100	4,000	4,500	3,600	4,600	4,600	4,600	4,600
Vehicles	920	930	940	950	750	760	760	990	1,000	730	740	760	770	780	790
Vehicles-initial spares	280	280	280	290	220	230	230	300	300	220	220	230	230	230	240
Support equipment	900	980	1,100	1,100	1,100	1,300	1,300	1,300	1,300	1,300	1,200	1,200	1,300	1,300	1,300
Operating costs	3,300	3,500	3,600	3,600	3,600	3,800	3,900	4,000	4,000	4,100	4,100	4,100	4,100	4,200	4,200
Armor. force veh.-oper. spares	450	460	460	440	290	360	390	380	410	420	420	420	420	420	420
Weapons-operating spares	460	460	460	460	470	480	480	490	500	500	510	520	520	520	530
Vehicles-operating spares	1,000	1,100	1,100	1,100	1,200	1,200	1,200	1,200	1,300	1,300	1,300	1,400	1,400	1,400	1,400
SPOL a/	510	510	510	510	510	510	510	550	550	550	550	550	550	550	550
Misc. support expenses	900	980	1,100	1,100	1,100	1,300	1,300	1,300	1,300	1,300	1,200	1,200	1,300	1,300	1,300
Personnel	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000
Pay and allowances	11,000	11,000	11,000	11,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000
Subsistence	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000
Clothing	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900	2,900
Miscellaneous services	720	720	720	720	730	730	740	740	740	740	740	740	740	740	740
Total	38,000	39,000	41,000	41,000	42,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000

a. Petroleum, oil, and lubricants.

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expenditures leveled off at about 44 billion rubles.

On the basis of the assumptions made, many of the individual expenditure series are at constant levels over time, particularly with regard to the projection period, 1956-61. Major equipment expenditures increased from a 1947 value of 9 billion rubles to some 13 billion in 1952, thereafter remaining fairly stable. The stability of the procurement of major ground force equipment, specialized vehicles and weapons, at 6 or 7 billion rubles each year indicates a rather steady program of modernization, maintenance, and replacement for a virtually constant force level. The temporary rise in tank procurement in 1949 and 1950 largely results from the changeover to the production of the T-54 tank and the concomitant requirement to fill the pipeline with spare parts. In 1958 and 1960, new medium and heavy tanks are introduced and their procurement rates are low temporarily. The expenditure series does not reflect a corresponding drop, however, because the new types of equipment carry a high unit price associated with early production of new models.

Ammunition is one of the more variable ground-forces procurement items. Actually, for all the types of forces, all ammunition except bombs and naval mines and torpedoes are included in this expenditure estimate. Because it was not possible to produce a practical estimate of outlays for maintaining the ammunition stockpile, there is some understatement of expenditures for the ammunition program on the whole. However, the overstatement of ground force ammunition procurement, by reason of the inclusion of ammunition produced for other types of forces, would tend to offset this possible understatement in the expenditures for the ground forces. The expenditure series shows a steady increase from 0.6 billion rubles in 1947 to a level of over 4 billion rubles in 1952 and then remains relatively stable.

The slight increase in operating expenditures over the period of the projection is primarily the result of vehicle operating expenditures

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as the vehicles of the Soviet Ground Forces are modernized over time. It should be noted that the vehicle figures shown here do not include vehicles for shore-based naval use (coastal defense and naval infantry) as these items are included in the expenditures for the naval forces.

Direct personnel expenditures cover four items: pay and allowances, subsistence, clothing and supplies for miscellaneous services such as food service, utilities, laundry and bath services and other administrative expenses, including fuel. The estimates of expenditures are relatively constant at some 27 billion rubles over the entire period since these outlays are a function of the number of troops, which remain quite stable. These outlays account for 60 to 70 percent of the estimated total expenditures of the Soviet ground forces.

c. Budgeted Expenditures for the Soviet Naval Forces

In Table 2,* there are summarized all identifiable and allocable expenditures for the Soviet Naval Forces. The indicated expenditures reveal the effort which the USSR has put forth to develop its naval strength. Annual expenditures almost quadrupled by 1955, rising from 6 billion rubles in 1947 to 22 billion rubles in 1955. Total expenditures for the naval forces continue in 1956 and 1957 the rising trend noted in the previous 3 years, reaching a peak of 25 billion rubles in 1957. In 1958, expenditures drop to 22 billion rubles as the production of naval vessels is estimated to be cut back. The increase during the last three years of the series is due to increasing operating expenditures inasmuch as equipment procurement remains virtually constant in this period.

In the equipment procurement series, the construction of new naval vessels is the major influencing factor. The figures for construction of new naval vessels represent expenditure for fully outfitted naval vessels including equipment and initial spare parts. Two trends are noted. Expenditures for naval construction rose from about 1 billion rubles in 1947 to more than 9 billion rubles in 1950, which was apparently

* Table 2 follows on page 21.

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Table 2
Budgeted Expenditures for the Naval Forces of the USSR, 1947-61

Million 1951 Rubles	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961
Major equipment procurement	1,900	3,400	7,900	11,000	10,000	9,000	10,000	13,000	15,000	16,000	17,000	14,000	14,000	14,000	14,000
Naval vessels, new	950	2,400	6,600	9,400	8,800	7,300	9,200	12,000	14,000	14,000	15,000	12,000	12,000	12,000	12,000
Naval vessels, overhaul and refit	400	470	540	630	680	710	780	850	970	1,200	1,300	1,500	1,800	2,000	2,300
Mines and torpedoes	480	510	750	810	850	850	470	470	470	440	440	440	440	440	440
Vehicles (including initial spares)	33	33	33	33	120	75	75	94	85	120	95	92	92	110	110
Operating expenditures	4,400	4,500	4,600	4,700	5,700	5,900	6,000	6,400	6,700	7,300	7,900	8,400	8,800	9,300	9,800
Personnel expenditures	3,600	3,600	3,600	3,600	4,400	4,400	4,400	4,600	4,700	5,100	5,400	5,700	5,900	6,200	6,500
Pay and allowances	1,900	1,900	1,900	1,900	2,300	2,300	2,300	2,400	2,500	2,700	2,900	3,100	3,200	3,300	3,500
Subsistence	1,300	1,300	1,300	1,300	1,600	1,600	1,600	1,700	1,700	1,800	1,900	2,000	2,000	2,200	2,300
Clothing	320	320	320	320	400	400	400	420	420	460	480	500	510	540	570
Services	80	80	80	80	100	100	100	100	110	110	120	120	130	140	140
Operating spares, material, supplies and equipment	230	260	280	360	390	440	530	590	670	780	910	1,000	1,100	1,200	1,300
POL a/	470	550	590	650	710	890	990	1,100	1,200	1,300	1,500	1,600	1,700	1,800	1,900
Motor vehicle operating spares	77	77	77	77	86	86	86	88	89	93	96	98	100	100	100
Total	6,300	7,900	12,000	16,000	16,000	15,000	17,000	20,000	22,000	23,000	25,000	22,000	23,000	23,000	24,000

a. Petroleum, oil, and lubricants.

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the peak year for the cruiser and destroyer production effort. The second sharp upward trend in the construction expenditures for naval vessels, noted in Table 2, is caused mainly by an expansion of the intensive submarine building program in 1953. This program continues at an accelerated pace through 1957 when vessel construction outlays mount to 15 billion rubles. In 1958 the submarine and destroyer construction programs are estimated to be cut back sharply and continued at a constant rate along with the other programs through the subsequent years of the estimate. The estimated level of procurement accounts for 12 billion rubles from 1958 through 1961. This estimate does not make provision for the production of nuclear-powered naval vessels or other naval developments which might influence the trend of the estimate in the later years.

The second items of procurement, overhaul and refit of naval vessels, although not strictly a procurement item, is included here because of the institutional arrangements between the Ministry of Defense and the Ministry of the Shipbuilding Industry, which performs most of the major repair work for the Soviet Navy, and because it is felt that the overhaul program in the USSR has been coupled with an extensive program of refitting and modernization. This series reflects the growing size of the naval forces and rises steadily to reach approximately 1 billion rubles in 1955 and over 2 billion rubles in 1961. The estimates for 1956-61 are a straight projection of the historical series. No attempt has been made to modify the factors to account for the increasing complexity of equipment in either the overhaul or improvement aspects of such a program.

The procurement program for mines and torpedoes rises steadily in the early postwar years, reaching a peak in 1952. Thereafter, this program declines rather sharply (approximately 50 percent) to a level of 440 million rubles in 1956. The 1956 level is maintained throughout the projection period (20,000 mines and 3,500 torpedoes). Because

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consumption of these items is not significant, virtually all these items add to the growing stockpile of underwater munitions.

The operating expenditures are, as would be expected, closely associated with the growing numbers of vessels in the Soviet Navy. Expenditures for personnel, covering pay and allowances, subsistence, clothing, and miscellaneous services, are based on estimated personnel strength figures. Although these expenditures do not reflect all the variations in the order of battle, they are in general responsive to the needs of the growing fleet in the later part of the historical period and reach almost 5 billion rubles in 1955. In the projection period, 1956-61, expenditures for personnel constitute roughly two-thirds of the operating expenditures, somewhat less than in the preceding period, and increase to a peak of 6.5 billion rubles in 1961.

The estimates for operating spare parts, materials, supplies, and equipage reflect the changing OB and are intended to cover naval vessel requirements for maintenance, operations, and the ordinary repairs performed by the naval establishment. Estimates during the period 1947-55 more than triple, rising to almost 700 million rubles in 1955 and to almost twice this figure by 1961. Although this projection (1956-61) is again based on vessels in the OB, it reflects the increasing impact of the submarine in the operating program because a higher expenditure factor per standard displacement ton applies to submarines. Although these figures may not appear extremely large, they should be considered in conjunction with the overhaul figures which are included in the procurement category. The combined figures amount to 1.5 billion rubles in 1955 and to more than 3.5 billion rubles in 1961.

Expenditures for POL were estimated independently for all services. The estimates include requirements for both forces afloat and forces ashore. One exception to the general pattern which should be noted here is that the estimated requirements for the otherwise excluded coastal defense forces are included in the expenditures for POL because of the

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nature of the basic estimate. The estimate more than quadruples during the period, reaching 1.9 billion rubles in 1961.

d. Budgeted Expenditures for the Soviet Air Forces.

The estimated expenditures for the Soviet Air Forces for the period 1947-61 are detailed by major category in Table 3.* The over-all total, which is influenced most heavily by aircraft procurement, reaches a plateau in the early 1950's when the estimated expenditures attain a value of 33 billion rubles and then rises again, reaching 66 billion rubles in 1958. A decline in 1959 resulting from cuts in aircraft procurement associated with model changes in the production program is followed by a return to an increasing pattern of expenditure. A peak level of 75 billion rubles is achieved in 1961 as a result of series production of new aircraft.

The aircraft procurement subcategory, which is detailed by major types of aircraft, includes only the basic airframe, engine, electronics, armament, accessories, and propellers. These estimates, which are influenced significantly by the introduction of new models of aircraft, rise steadily and sharply from 4.2 billion rubles in 1947 to 12 billion rubles in 1951. In the succeeding three years, these estimates drop slightly, again rise sharply to almost 28 billion rubles in 1958, drop to 24 billion in 1959, and rise to 31 billion in 1961.

It should be noted in reference to Table 3 that the numbers of aircraft procured increase only slightly during the period, ending 1961. The outlay per aircraft, however, rises sharply as complex new models of aircraft are introduced and causes the large increase in the procurement expenditures for aircraft.

Aircraft spare parts are divided into two categories: initial spares and operating spares. Initial spares are those spare parts manufactured in conjunction with the aircraft and provide the basic stock on hand with the aircraft, in depots, and in the pipeline. Operating spares are

* Table 3 follows on page 25.

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Table 3

Budgeted Expenditures for the Air Forces of the USSR, 1947-61

Million 1951 Rubles	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961
Aircraft procurement	4,200	5,700	6,000	8,600	12,000	11,000	10,000	11,000	16,000	18,000	25,000	28,000	24,000	28,000	31,000
Fighter	1,300	1,700	1,800	3,500	4,500	3,900	4,700	3,900	5,000	5,700	8,100	8,100	7,900	14,000	18,000
Ground attack	330	290	160	-	-	-	-	-	-	-	-	-	-	-	-
Light bomber	860	1,300	930	1,900	4,100	3,800	3,000	3,400	2,500	1,900	2,500	4,300	3,600	2,800	2,600
Medium bomber	210	1,300	2,200	2,700	2,600	2,400	980	1,800	4,800	5,300	2,000	1,700	1,600	1,900	2,500
Heavy bomber	-	-	-	-	-	-	630	1,000	2,100	3,400	9,000	11,000	8,100	6,800	6,400
Other	1,500	1,200	880	520	890	990	940	1,100	1,200	1,300	3,000	2,700	2,500	2,500	2,100
Aircraft spares	2,300	3,000	3,300	4,300	6,000	6,000	6,000	6,800	8,800	11,000	13,000	15,000	15,000	17,000	19,000
Initial	1,800	2,300	2,400	3,200	4,600	4,400	4,100	4,400	6,100	7,300	9,500	11,000	8,900	11,000	12,000
Operating	480	630	910	1,000	1,400	1,600	1,900	2,400	2,700	3,400	3,900	4,700	5,700	6,500	6,900
Personnel costs	9,000	9,800	9,800	9,800	10,000	11,000	12,000	12,000	13,000	14,000	14,000	15,000	15,000	15,000	15,000
Pay and allowances	5,900	6,400	6,500	6,400	6,700	7,000	7,500	8,000	8,500	8,200	9,400	9,300	9,700	9,800	9,800
Subsistence	2,400	2,600	2,600	2,700	2,800	2,900	3,100	3,300	3,500	3,800	3,800	3,800	3,900	3,900	3,900
Clothing	600	650	650	660	690	720	780	820	880	940	950	960	970	980	980
Services	150	160	160	170	170	180	190	210	220	240	240	240	240	240	240
POL a/	710	770	820	950	1,200	1,600	2,100	2,300	2,400	3,400	4,200	4,700	5,200	5,300	5,400
Bombs	120	150	170	200	230	310	320	340	330	330	180	150	150	150	150
Organizational equipment	1,200	1,500	2,100	2,600	2,800	3,000	3,500	3,300	2,900	3,200	3,200	3,600	3,700	3,400	3,300
Vehicle procurement	10	120	160	300	370	340	590	510	150	150	180	350	360	360	330
Vehicle operating expenses	180	180	180	190	200	210	230	250	250	260	260	260	260	270	270
Support equipment procurement	100	300	500	750	850	950	1,200	950	750	700	700	600	700	700	600
Support operating expense	520	520	520	530	550	580	620	640	640	650	660	660	670	680	680
Training equipment procurement	70	70	140	180	180	180	180	200	220	350	350	420	420	350	350
Training operating expense	280	280	560	700	700	700	700	780	870	1,000	1,000	1,300	1,300	1,000	1,000
Total	18,000	21,000	22,000	27,000	33,000	33,000	34,000	36,000	43,000	49,000	60,000	66,000	62,000	69,000	75,000

a. Petroleum, oil, and lubricants.

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those parts consumed by normal operations of the aircraft. Both categories include the spare parts for the components of the aircraft listed above. Procurement of initial spares naturally follows the same pattern as aircraft procurement and reaches some 12 billion rubles in 1961. Procurement of operating spares shows a continuous rise during the period from less than 0.5 billion rubles in 1947 to 6.9 billion rubles in 1961. This increase is the combined effect of a growing OB and an increasing complexity of aircraft in the OB.

The personnel category has four components: pay and allowances, subsistence, clothing, and miscellaneous services. Estimates of expenditures for personnel reflect the changing requirements to maintain and operate the aircraft in the OB. They vary from 9 billion rubles in 1947 to 15 billion rubles in 1961. The increase in the projection period allows for the manning of the equivalent of an additional 17 air regiments estimated to be introduced during the period.

The POL category includes fuel and lubricants for all aircraft and motor vehicles operated by the air forces. The estimates represent consumption and make no provision for build-up of stocks. They depend mainly on, and are heavily influenced by, the numbers and types of aircraft operating in the Soviet OB. In the projection period this increase is influenced more by the increasing weight and power of the new models of aircraft than by increasing numbers of aircraft. Nearly a 7-fold increase is noted over the period 1947-61, and the estimate reaches 5.4 billion rubles in 1961.

The category for expenditures on bombs represents procurement of aerial bombs and does not imply consumption. Whatever is not consumed in training presumably enters the Soviet stockpile. No estimate is made of training consumption or the magnitude of the stockpile. All other air-force ammunition and rockets cannot be readily differentiated from total ammunition expenditures and therefore are contained in the ground forces section. Procurement of conventional aerial bombs has been scaled

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down during the period 1955-58 from the high level of procurement in the period during and immediately following the Korean War. This procurement is then held at 150 million rubles per year--a figure thought to be adequate to provide for peacetime consumption of conventional air weapons. This level is maintained throughout the remainder of the projection. It should be noted that atomic weapons are not included in the calculation of expenditures for the forces.

The organizational-equipment category provides for all other expenditures for the air forces. Again the estimates reflect the growing size and complexity of the Soviet Air Forces. During the historical period a reequipment schedule was instituted to coincide with the introduction of jet-aircraft operating units into the air OB. The increase in the projection period allows for the initial equipping of the equivalent of 17 air regiments estimated to be introduced during this period and for providing specialized handling and training equipment for the new models of aircraft to be introduced.

e. Other Budgeted Defense Expenditures*

The estimated expenditures for the period 1947-61 of direct functions and expenditures of the Ministry of Defense that cannot be conveniently allocated to a specific military service are listed in Table 4** by major category of expenditure. These expenditures stay at a relatively constant level of about 12 billion rubles during the late 1940's but start to rise gradually in 1950 because of the expansion of the PVO command control and radar system. An increase in the expenditures for communications causes a sharp jump in 1952, and this increase is accelerated thereafter by the introduction of guided missile expenditures. Total expenditures for this group of items amount to 23 billion rubles in 1955 and 37 billion rubles in 1961, a decline of approximately 1 billion rubles from the 1960 level.

* That is, budgeted to the Ministry of Defense of the USSR.

** Table 4 follows on page 28.

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Table 4
Other Budgeted Military Expenditures of the Ministry of Defense of the USSR, 1947-61

Million 1951 Rubles	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961
Guided missiles	-	-	-	-	-	-	230	2,100	4,500	5,800	4,900	11,000	15,000	18,000	16,000
PVE command control and radar system	120	180	310	1,100	1,700	2,200	2,500	2,600	3,100	4,000	3,300	2,700	2,600	2,300	2,400
Transportation	610	630	660	690	1,000	1,000	980	780	770	800	800	800	800	800	800
Communications	590	720	630	650	670	1,400	1,400	1,500	1,600	1,600	1,700	1,600	1,700	1,700	1,700
Construction	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Civilian personnel pay	2,900	2,900	3,000	3,000	3,100	3,100	3,700	4,000	3,900	3,900	3,800	3,700	3,700	4,200	5,600
Medical expenses (military personnel)	2,800	2,800	2,800	2,800	2,900	2,900	3,000	3,000	3,000	3,100	3,100	3,100	3,200	3,200	3,200
Publishing and printing expenses	890	910	910	910	930	940	950	960	970	980	1,000	1,000	1,000	1,000	1,000
Retirement pensions	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350
Subsistence for military reserves	1,100	1,500	2,000	2,200	2,300	2,400	2,600	2,700	2,900	3,000	3,200	3,300	3,500	3,600	3,700
Total	11,000	12,000	13,000	14,000	15,000	16,000	17,000	20,000	23,000	26,000	24,000	29,000	34,000	38,000	37,000

a. Antiair defense (Protivo-vozdushnaya oborona).

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Guided missile expenditures included here are based on the previous estimates contained in NIE 11-6-54 and NIE 11-5-55. It was necessary to modify both previous estimates because of refinements in available price information and the necessity to eliminate double counting. Estimates of expenditures for the surface-to-air missile were taken from NIE 11-5-55 and all other missile expenditures were taken from NIE 11-6-54. The total missile expenditure includes outlays for missiles and for associated support equipment. Expenditures for construction of missile sites, personnel pay and allowances, and training expenses were eliminated because they are included elsewhere. (New estimates, however, are currently being developed for NIE 11-5-56 and preliminary indications suggest that upward revisions may occur.) The decline in expenditures in 1961 from the 1960 peak is based on assumptions concerning the introduction of a new model surface-to-air missile (SAM) and a temporary decrease in the air-to-air missile requirements as a result of an aircraft model changeover.

Expenditure for the PVO command control and radar system covers all headquarters elements in the air defense system including the communications facilities and ground radar (Early warning--EW, GCI, fire control--FC, identification friend or foe--IFF) associated with the system. The estimate essentially reflects expenditures for the various items of equipment because all other outlays are included in other categories. This series reaches a peak of 4 billion rubles in 1956, after which the rate of growth in the program diminishes and is reflected in a decline in the annual expenditures for the program which level off at 2.3 billion rubles in the last 2 years of the projection.

All transportation expenditures that could be estimated for all organizations of the Ministry of Defense are included except for POL, which are included in the estimate of POL expenditures by reason of the fact that the available prices include transportation charges. For the period 1956-61, transportation expenditures are projected at the 1955

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levels.

The total expenditure on communications consists of 4 primary elements: (1) investment in facilities and equipment; (2) maintenance and repairs; (3) utilities; (4) leased service. It should be noted that only expenditures on fixed communications facilities, defined to include all communications facilities down to army, airbase and naval base levels, are included. Mobile communications facilities are included generally as part of major or organizational equipment. During the period 1955-61 the investment portion of the estimate is reduced in steps. The investment levels allow for replacement of some of the earlier equipment with high-speed data-handling equipment and for some extension of the communications system. The operating portion of the estimate is related to total investment in the communication system and, hence, rises during the period sufficiently to cause the series to remain virtually constant.

The estimate of construction expenditures is largely restricted to replacement or maintenance of existing facilities except in the case of POL storage facilities, new major airfields, and the possible guided missile sites around Moscow. Naval technical base facilities had to be omitted entirely by reason of lack of information. Similarly, the cost of installed equipment, an expenditure related to construction, had to be ignored except where it could be picked up as organizational equipment. In the projection period the construction series shows little change from the 1955 level until 1960 and 1961 when increases are introduced to allow for the construction of sites and facilities for a new model SAM and for the intercontinental ballistic missile(ICBM), both of which are introduced into the estimate at this point.

Civilian personnel pay was estimated on a minimum basis and was included to provide some gross order of magnitude to cover the probably sizable civilian labor force associated with various activities subordinate to the Ministry of Defense. Medical expenses for military personnel were estimated on a ministry-wide basis. It was necessary to use US analogues in order to estimate the approximate size of these expenses.

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The two categories, civilian pay and medical expenses for military personnel, in the period 1956-61 are based on the projection of military personnel requirements during that period and employ the factors developed for the historical period. Both categories of expenditure increase only slightly from their 1955 levels of 5 billion and 1 billion rubles respectively.

For estimates of expenditures for publishing and printing, US analogues were also used. It is obvious that publishing and printing outlays would vary from year to year. However, it was not possible at this time to make a refined estimate. Therefore the total expense of this category represents an approximation of the order of magnitude only.

Retirement pensions for military personnel were included because virtually incontrovertible evidence asserts that this type of expenditure is in the Soviet Defense Budget. A good basis for estimating the magnitude, however, does not exist. By the combining of US experience in numbers on the retired rolls with Soviet rate of payments, a crude, but probably minimum, estimate of the retirement bill was made. The period to 1948 reflects a rapid post-demobilization buildup in the rolls and is followed by a slower buildup from 1949 to 1961.

Subsistence for reservists and their salaries while on active duty (half-pay from the organization where normally employed) are the elements of expenditures for reserve duty. Reservist strength is estimated to range from 24 million to 28 million men over the period 1950-61. It is not thought that this number of reservists serves for the length of time indicated in the Soviet law. Were such lengthy service the case, the manpower loss the Soviet economy would incur would be of significant proportions. Hence, one-third of the expense that the full legal requirement would incur has been taken to represent a more realistic magnitude. Expenditures for subsistence, however, are the only element of budgeted expenditure. Salaries of reservists are not covered by the budget of the Ministry of Defense, and are included, therefore, in the following section.

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2. Nonbudgeted Defense Expenditures*

To this point, only items of direct military expenditure have been included. It is now possible to cover some of the other items of expenditure bearing on the total defense effort. These items are: (1) the militarized components of the MVD-KGB; (2) the Military Reserves; (3) DOSAAF; (4) the capital and operating expenditures of the atomic energy establishment; and (5) research and development, including "product development."** Although the information currently available precludes making refined estimates of these categories, rough approximations on a conservative basis can provide reasonable orders of magnitude. Those phases of the Soviet effort for which it is still not possible to estimate expenditures are the bulk of construction expenditures for military public works and those phases of pricing policy which permit the military to acquire goods and services for less than full cost--for example, the possible exclusion of some overhead and capital costs and the possibility of differential costs of materials.

As indicated in Table 5*** the total of these additional expenditures is estimated to range from some 24 to 53 billion rubles over the period 1947-61. The major element of these expenditures is research and development, including product development, which accounted for 10 billion rubles in 1947 and is estimated at roughly 26 billion rubles in 1961. Annual outlays for the capital and the operating expenditures of the atomic energy establishment are estimated to range from 1 billion to 13 billion rubles; for the militarized MVD-KGB, between 8 and 9 billion rubles; for the pay of reservists, 2 billion rubles; and for DOSAAF 0.5 billion rubles.

* That is, not budgeted to the Ministry of Defense.

** The term product development is defined to include design and production engineering, experimental production, testing, prototype production, and a variety of associated activities. Research and development is defined to include basic and applied research and its application to new uses up to the point of design and production engineering.

*** Table 5 follows on page 33.

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Table 5.

Non-Budgeted Military Expenditures of the USSR, 1947-61^a

Billion 1951 Rubles	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961
Research and development	10	10	9	10	11	12	12	13	16	19	20	21	22	24	26
Nuclear energy	1	1	2	3	4	5	6	7	8	9	10	11	12	12	13
Militarized MVD-KGB ^b	9	9	9	9	9	9	8	8	8	8	8	8	8	8	8
Reserves	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
DOSAAF ^c	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Total	22	23	23	26	27	29	29	31	35	39	41	42	45	47	50

a. That is, not explicitly budgeted to the Ministry of Defense.

b. The militarized components of the Ministry of Internal Affairs (Ministerstvo Vnutrennikh Del--MVD) and the Committee on State Security (Komitet po Gosudarstvennoy Bezopasnosti--KGB).

c. The Voluntary Society for Cooperation with the Army, Air Force, and Navy (Dobrovolnoye obshchestvo Sodeystviya Armii, Aviatsii, i Flotu--DOSAAF).

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It will be noted that, in general, the estimates of these additional items of military expenditure represent minima not only for the reasons given in the discussion which follows but also, in the cases of the militarized components of the MVD-KGB and the reserves, because there are undoubtedly other operating expenditures besides the personnel expenditures accounted for. It is thought, however, that these other operating expenditures are rather small and therefore not likely to affect the reasonableness of the estimates.

Research and development expenditures, exclusive of product development, for the entire Soviet economy can be approximated roughly for 1947-56 from announcements of actual or planned expenditures for financing research institutions. These same expenditures can be projected to 1961 on the basis of expenditures per scientist and the projected number of scientists. Because research and development expenditures of the US Department of Defense are about 35 percent of the national total of expenditures and those of the Atomic Energy Commission (AEC) some 8 percent of the national total and because the relative emphasis on military effort in the USSR is so great, it is thought that about two-thirds of the total Soviet effort represents a reasonable estimate of the research and development expenditures of the Soviet military establishment.

Expenditures for product development of the US Department of Defense are at least equal to research and development expenditures. A similar relationship between expenditures for product development and those for research and development was assumed for the USSR, possibly leading to an understatement of Soviet expenditures. Thus the total Soviet military research and development program, including product development, is thought to be twice the estimate of military research and development expenditures, excluding product development.

Expenditures for the MVD are based on personnel strength and include pay, subsistence, clothing, and miscellaneous minor personnel services.

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The estimate of militarized personnel strength, roughly 400,000 men, was held constant for the period of the estimates. For the troop units, which account for the bulk of militarized MVD manpower, the average pay scale estimated for the ground forces was used. For headquarters personnel and personnel of the Chief Directorate of Local Air Defense (Glavnoye Upravleniye Mestney Protivovozdushnoy Oborony--GUMPVO), a modified average officer pay scale was used. Expenditures for subsistence, clothing, and miscellaneous personnel services for all MVD personnel were obtained by applying the average previously obtained for the combined ground, air, and naval forces although it is probable that the MVD fares somewhat better in this respect.

An estimate of expenditures for the militarized KGB is somewhat more difficult. A reasonable amount of pay data is available, but militarized personnel strengths are not known. However, on the basis of the information on known KGB assignments to regular military units and from crude analogy with organizations in the US, it is estimated that a manpower figure of 100,000, or 25 percent of the estimated strength of 400,000, is relevant to this study. As with the MVD, the subsistence, clothing, and miscellaneous personnel expenditures applicable for the Soviet military forces were utilized for the KGB.

For a brief explanation of Soviet expenditures on their reserve program see page 31, above. The salaries of reservists represent the only element of this program which is a non-budgeted expenditure and as such are included in this section.

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On the basis of the principle that the inclusion of rough approximations of expenditures for certain programs provides a more realistic estimate of total expenditures than an estimate which omits this aspect entirely, the military aspects of the Soviet atomic energy program were estimated on the assumption that its progress pattern is similar to that of the US but displaced in time.

Method: Procedurally, the first step was to derive a series describing a pattern of expenditures of the military aspects of an atomic energy program from its inception. The expenditures for the entire US program from its beginnings in the Manhattan District project were obtained. To arrive at a dollar estimate of Soviet capital and operating expenditures, research and development and product development were eliminated from this US series. The series was then converted into constant dollars and smoothed by fitting a linear trend line. Because underlying data were almost exclusively for military purposes, the projection of this trend was considered a conservative approximation of the future pattern of expenditures for the military aspects of an atomic energy program.

To convert the US data into a representation of the Soviet program these further steps were necessary. The Soviet program was assumed to have begun in 1947--an assumption of a four year lag relation to the equivalent phase of the US program. To reflect the gains the USSR undoubtedly achieved through knowledge of the fact of, as well as specifics about, the US program, a gradual reduction of this lag to two years by 1961 was further assumed. Finally, this adjusted series was converted to rubles with a ruble-dollar ratio approximating the

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investment ratio.

As a check on this rough procedure, the results were compared with the residual obtained from a functional breakdown of the Soviet budgetary category "Financing the National Economy" where, according to available evidence, Soviet atomic energy expenditures are included. The funds available from this category are in all cases more than adequate to provide for these expenditures for atomic energy.

C. Initial and Operating Expenditures

1. General

To provide a meaningful and consistent estimate of the Soviet military system, it was necessary to distinguish between initial expenditures and operating expenditures. Initial expenditures are those which occur only once during the establishment of a program and include such items as base facilities, original major and organizational equipment and spares for stocks and pipeline. Operating expenditures pertain to those expenditures which recur regularly, representing the consumption of fuels, maintenance spares, and materials and supplies, the pay and other support of personnel, the maintenance of facilities, and the use of such services as transportation and communications.

The following discussion of initial and operating expenditures is limited, however, only to those expenditures budgeted to the Ministry of Defense because sufficient detail was not available to permit such analysis for all the expenditures not budgeted to the Ministry of Defense.

2. Initial Expenditures

The estimated initial expenditures of the Soviet military program from 1947 to 1955 are detailed in Table 6* by major category of expenditure and compared in total with operating expenditures. Comparison shows that initial expenditures are less than operating expenditures for each year, though by 1955 both these categories approach equality. Initial expenditures show a steady increase through the period from about 19 billion rubles in 1947, or 25 percent of total budgeted expenditures, to

* Table 6 follows on page 38.

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Table 6

Budgeted Initial Expenditures of the Ministry of Defense of the USSR, 1947-61

Million 1951 Rubles	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961
Armored force vehicles	3,300	2,800	3,600	3,200	2,800	3,000	2,900	2,800	2,700	2,900	3,100	2,700	2,800	2,600	2,800
Weapons	2,500	2,700	2,800	2,900	3,200	3,400	3,700	3,700	3,700	3,300	3,400	2,900	2,900	2,900	2,900
Ammunition	630	1,800	1,900	2,200	3,300	4,200	4,400	4,100	4,000	4,500	3,600	4,600	4,600	4,600	4,600
Mines and torpedoes	480	510	750	810	850	850	470	470	470	440	440	440	440	440	440
Bombs	120	150	170	200	230	310	320	340	330	250	180	150	150	150	150
Naval vessels	1,400	2,800	7,100	10,000	9,500	8,000	9,900	13,000	15,000	15,000	17,000	13,000	13,000	14,000	14,000
Aircraft	6,000	8,000	8,400	12,000	17,000	15,000	14,000	16,000	22,000	25,000	34,000	39,000	32,000	39,000	44,000
Vehicles	1,200	1,400	1,400	1,600	1,500	1,400	1,700	1,900	1,500	1,200	1,200	1,400	1,500	1,500	1,500
Support equipment	1,100	1,400	1,700	2,000	2,200	2,400	2,600	2,400	2,300	2,300	2,300	2,300	2,400	2,300	2,200
Construction	1,500	1,600	1,600	1,600	1,600	1,700	2,300	2,500	2,400	2,400	2,300	2,200	2,200	2,700	4,100
Communications	200	300	200	200	200	900	800	800	900	800	800	700	700	600	600
Guided missiles	-	-	-	-	-	-	230	2,000	4,300	5,200	3,800	8,900	12,000	13,000	7,600
PVO command control and radar systems a/	120	170	300	1,100	1,600	2,000	2,200	2,100	2,500	3,300	2,300	1,500	1,400	970	960
Total	19,000	24,000	30,000	38,000	44,000	44,000	46,000	52,000	62,000	67,000	74,000	79,000	76,000	84,000	86,000
Initial expenditures as a percentage of total budgeted expenditures.	25	29	34	39	41	40	41	43	46	47	48	49	47	48	48

a. Antiair defense (Protivo-vozdushnaya oborona--PVO)

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86 billion rubles in 1961, or about 48 percent of total budgeted expenditures.

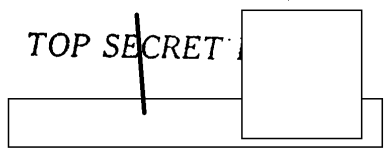
Initial expenditures for armored force vehicles and weapons are relatively constant during the period of the estimate. The model changes that are known to have occurred in small arms, artillery, tanks, and personnel carriers do not appreciably change the price relationships. The USSR, intelligence estimates indicate, has pursued a policy of modernizing the ground forces and increasing their firepower and mobility without a sizable increase in expenditures during the period by means of a sustained procurement effort. In contrast, the ammunition program, as estimated, caused a sharp rise in expenditures for this category particularly since 1951, exhibiting sharp growth prior to and immediately after this date. This effort seems to be related to ammunition provided during the Korean War and to the production of ammunition for new artillery weapons and small arms. Expenditures for ammunition during the 1950's constitutes a substantial portion of the initial expenditures for ground forces rising to about one-third percent of the total in the early 1950's and reaching a peak of 37 percent in 1953.

The expanding aircraft program estimated by intelligence caused a large increase in initial expenditures for aircraft during the period. From about 6 billion rubles in 1947, expenditures rose to 22 billion rubles in 1955 and to 44 billion rubles in 1961. These expenditures reflect, through 1955, the large jet re-equipment programs which led to the replacement of essentially all piston combat aircraft except the Bull medium bomber. For the period 1956-61, these expenditures largely indicate the expansion of the medium and heavy jet bomber forces. As indicated in Figure 3*, after a period of stable effort between 1947 and 1949, fighter procurement rose from 2 billion rubles in 1949 to 5 billion rubles in 1955 and is projected at 18 billion rubles in 1961. From 1951 to 1955, this series displays a slight upward trend with the

* See next page.

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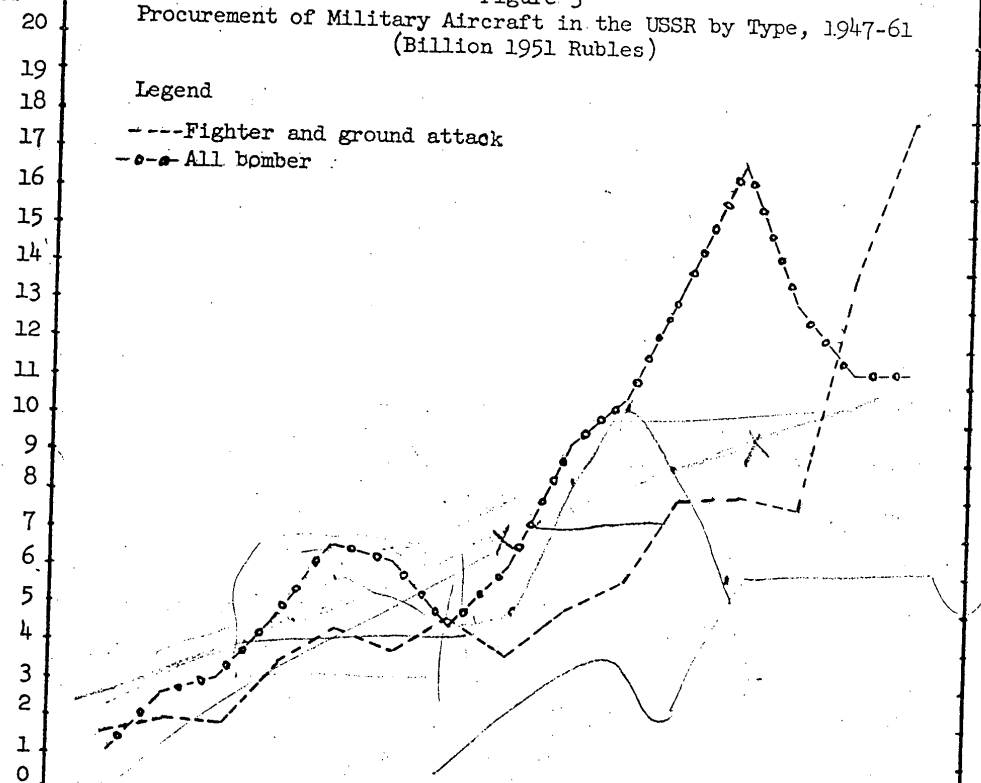
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Billion
rubles

Figure 3
Procurement of Military Aircraft in the USSR by Type, 1947-61
(Billion 1951 Rubles)

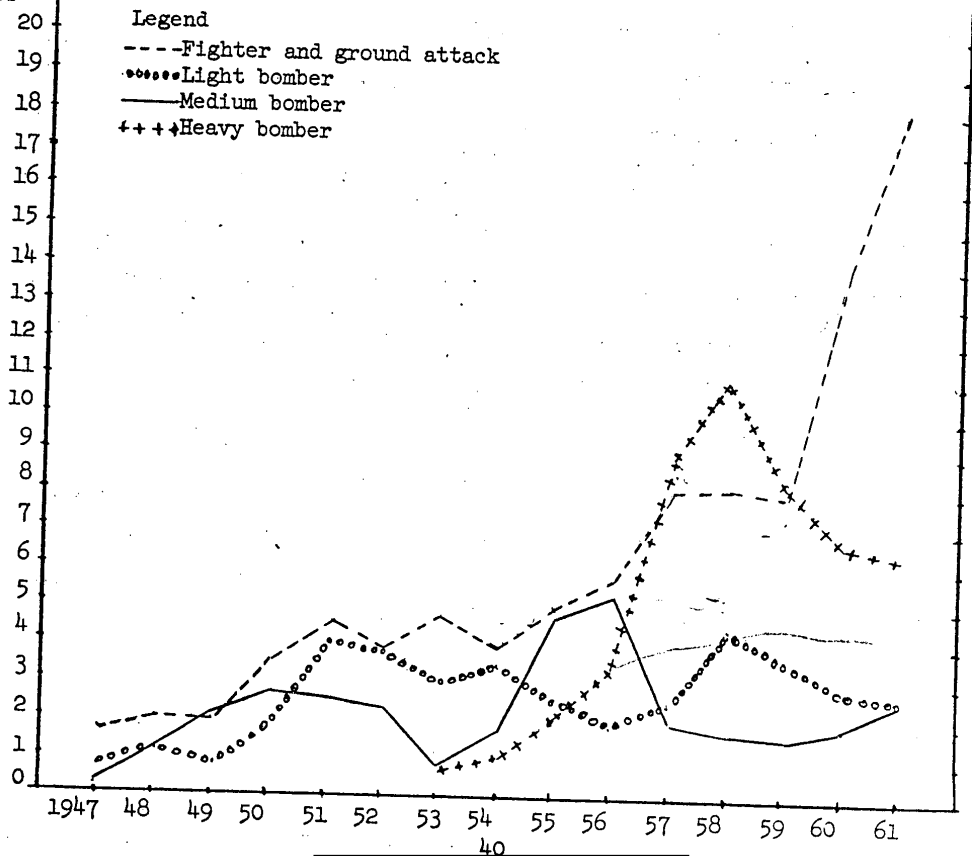
Legend
--- Fighter and ground attack
-o-o- All bomber



Billion
rubles

1947 48 49 50 51 52 53 54 55 56 57 58 59 60 61

Legend
--- Fighter and ground attack
..... Light bomber
—— Medium bomber
++++ Heavy bomber



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troughs in 1952 and 1954. After 1955 the trend in expenditures for fighter aircraft becomes sharply positive although these expenditures are estimated to be relatively stable for the three year period 1957 to 1959. Bomber effort displays a strong upward trend and has exceeded the value of fighter production in each year from 1948 to 1959 with the exception of 1953. The exception in 1953 seemingly was caused by a difficult model change in the medium bomber program. This switch in emphasis in the aircraft procurement program is due primarily to the initiation of the medium and heavy bomber programs which had no counterpart prior to 1947. This feature of the aircraft procurement program is illustrated in Figure 4* which shows that despite the absolute increase in the fighter program its relative weight in the total has tended to decline over the period. Conversely the relative weight of the bomber programs rose sharply to better than 50 percent by 1949 and exceeded 60 percent in 1954 and 1955. At the end of the period, 1960-61, however, another reversal is estimated with the advent of large-scale production of a new fighter.

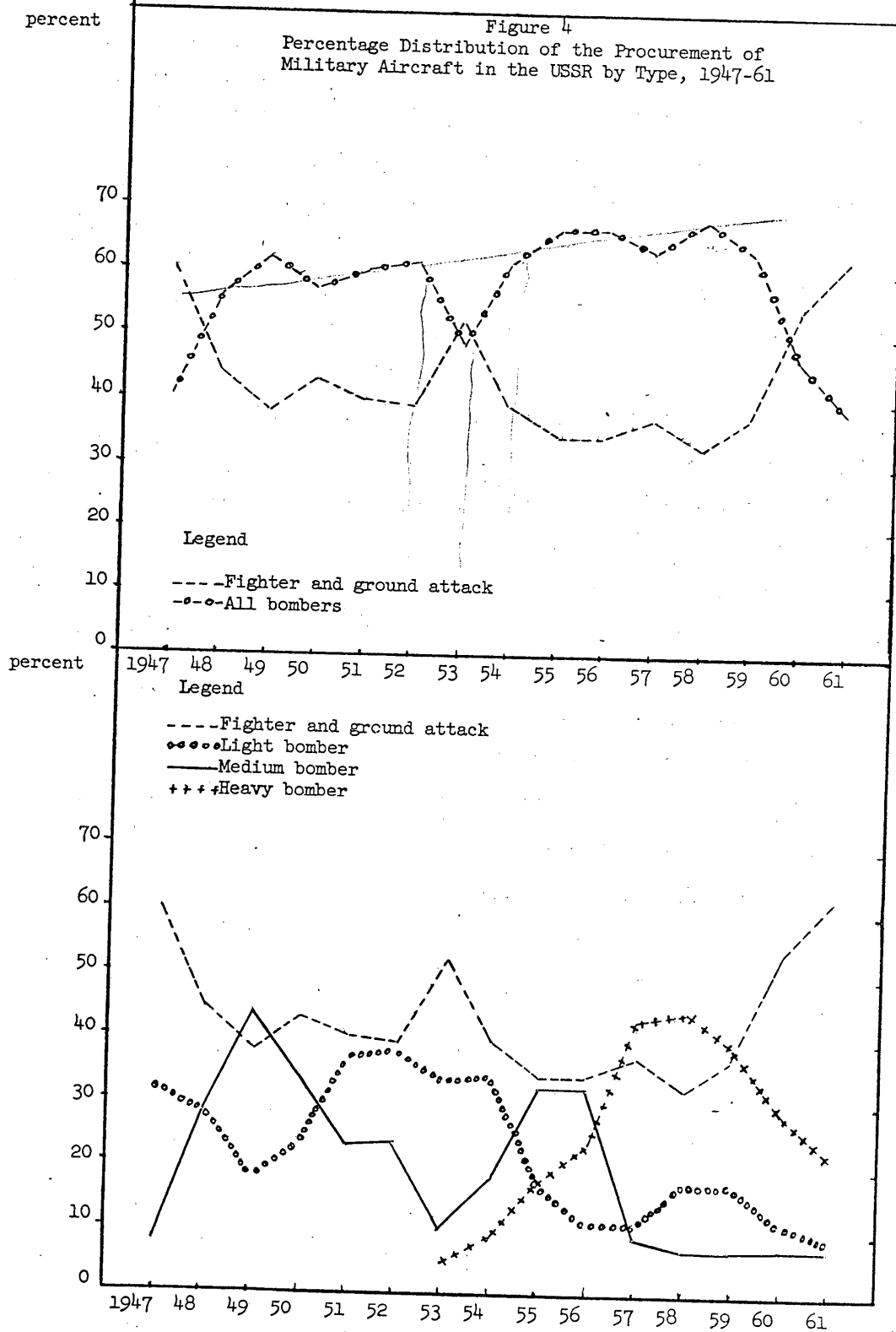
The naval vessel programs, according to intelligence estimates, showed the largest single increase of any major program during the historical period. Between 1947 and 1955 estimated expenditures for naval vessels rose from 1.4 billion rubles to 14.8 billion rubles. Thereafter, there was some small growth for two more years, followed by relative stability at a level slightly below that of 1955. The rapid rise in the late 1940's reached a peak in 1950 because of the construction of cruisers and destroyers. During the next 3 years there was a modest decline, but in 1954 and 1955 naval construction sharply rose primarily because of the initiation of a large submarine building program. Some idea of the magnitude of the estimated Soviet effort in naval ship construction can be gained from the fact that the cumulative expenditure of 70 billion rubles for the 9 year period 1947-55 represents the

* See next page.

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Figure 4
Percentage Distribution of the Procurement of
Military Aircraft in the USSR by Type, 1947-61



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procurement of more than 1 million standard displacement tons of new naval construction and that like amounts of expenditures and tonnage are estimated for the period 1956-61.

Procurement of guided missiles is estimated to have begun with the surface-to-air program in 1953. The series includes only missiles, missile spares, guidance equipment, and associated items. The estimated guided missile programs include surface-to-surface, surface-to-air, and air-to-surface types. These programs have a very sharp rise in initial expenditures, reaching 4.5 billion rubles in 1955 and thereafter increasing steadily, with the exception of 1957, to a peak of 18 billion rubles in 1960. Expenditures for the construction of the facilities of the Moscow guided missile sites and for the ICBM are included in the construction category. It should be noted that these expenditures were derived from the estimates of requirements contained in NIE 11-6-54 and NIE 11-5-55.

The PVO command control and radar category includes expenditures for radar, communications, and miscellaneous equipment for all the organizational elements of the control and warning system down to and including filter centers and radar sites. Expenditures for this category show a steady increase through 1956 conforming to the development of this system into an extensive air defense network, and gradually decline during the remainder of the period.

3. Operating Expenditures

Estimated operating expenditures of the Soviet military establishment for the period 1947-61 are detailed in Table 7.* The largest single category relates to personnel, including pay, subsistence, clothing and miscellaneous services. At the beginning of the period these expenditures were more than 70 percent of the total operating expenses for each year but steadily decline until they account for only some 54 percent. POL expenditures show a marked increase, particularly in the latter half of

* Table 7 follows on page 44.

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Table 7

Budgeted Operating Expenditures of the Ministry of Defense of the USSR, 1947-61

Million 1951 Rubles	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961
Armored force vehicle maintenance	450	460	460	440	290	360	390	380	410	420	420	420	420	420	420
Weapons maintenance	460	460	460	460	470	480	480	490	500	500	510	520	520	530	530
Naval vessel maintenance	230	260	280	360	390	440	530	590	670	780	910	1,000	1,100	1,200	1,300
Aircraft maintenance	480	630	910	1,000	1,400	1,600	1,900	2,400	2,700	3,400	3,900	4,700	5,700	6,500	6,900
Guided missile maintenance	-	-	-	-	-	-	-	21	190	600	1,100	1,700	3,400	5,600	8,200
Vehicle maintenance	1,300	1,300	1,400	1,400	1,500	1,500	1,500	1,600	1,600	1,700	1,700	1,700	1,800	1,800	1,800
Support	1,700	1,800	2,100	2,300	2,400	2,500	2,600	2,700	2,800	3,000	3,000	3,200	3,200	3,000	3,000
PVO command control and radar systems maintenance ^b	4	9	15	24	88	190	320	470	630	700	960	1,200	1,300	1,400	1,400
Personnel pay	19,000	20,000	20,000	20,000	21,000	21,000	22,000	22,000	23,000	24,000	24,000	24,000	25,000	25,000	25,000
Personnel subsistence	17,000	18,000	18,000	18,000	18,000	18,000	18,000	19,000	19,000	19,000	20,000	20,000	20,000	20,000	20,000
Personnel clothing	3,900	3,900	3,900	3,900	4,000	4,100	4,100	4,200	4,200	4,300	4,400	4,400	4,400	4,500	4,500
Personnel services	950	960	970	970	1,000	1,000	1,000	1,000	1,100	1,100	1,100	1,100	1,100	1,100	1,100
Transportation	610	630	660	690	1,000	1,000	980	780	770	800	800	800	800	800	800
Communications	390	420	430	450	470	540	610	680	740	820	890	950	1,000	1,100	1,100
Construction	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,500	1,500	1,500	1,500	1,500	1,500	1,500
Civilian pay	2,800	2,800	2,800	2,800	2,900	2,900	3,000	3,000	3,000	3,100	3,100	3,100	3,200	3,200	3,200
Medical	900	910	910	910	930	940	950	960	970	980	1,000	1,000	1,000	1,000	1,000
Publishing	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350
Pensions	1,100	1,500	2,000	2,200	2,300	2,400	2,600	2,700	2,900	3,000	3,200	3,300	3,500	3,600	3,700
Total	55,000	57,000	59,000	59,000	62,000	64,000	66,000	69,000	71,000	75,000	79,000	82,000	86,000	90,000	94,000

a. Petroleum, oil, and lubricants.

b. Antiair defense (Protivo-vozdushnaya oborona--PVO)

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the estimate. This is caused primarily by substantial increases in POL consumption for the naval forces and air forces. Expenditures for aircraft and naval vessel spare parts also increase with the former becoming quite substantial at the end of the period.

Some interesting facets of operating expenditures and their relationships over time can be seen by relating the data to appropriate common denominators. Table 8* shows the average operating expenditures of the ground forces per line division. The increasing complexity of the equipment is indicated to some extent in the slight upward trend.

Similar computations for the naval forces, presented in Table 9,** reveal a decrease in expenditure per displacement ton of operating naval vessels from 6900 rubles in 1947 to 3300 rubles in 1955 and a projected cost of 3100 rubles in 1961. The various components of total operating expenditures do not follow the same trend. Expenditures for POL decrease slightly and level off during the latter years of the estimate. Expenditures for operating spares decline somewhat in the middle years and then climb slowly. The largest single factor, however, personnel costs, appear to decline steadily from about 5600 rubles per ton of vessel in 1947 to about 2400 rubles in 1955 and 2100 rubles in 1961. There is no readily identifiable explanation for this decline.

The comparable air forces relationships shown in Table 10*** reveal a rise in total expenditures from 11 billion rubles in 1947 to almost 20 billion rubles in 1955 and a further increase to 29 billion rubles by 1961. Despite this growth of more than 160 percent in 15 years, the expenditures per operating air regiment rose gradually from 28 million rubles in 1950 to 49 million rubles in 1961. For the years 1947-49 there is no discernible trend, operating cost per regiment in each case being higher than it subsequently was in 1950. A somewhat higher expenditure per regiment could be expected in 1947-49 because of the greater number

* Table 8 follows on page 46.

** Table 9 follows on page 47.

*** Table 10 follows on page 48.

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Table 8

Budgeted Operating Expenditures for the Ground Forces of the USSR, 1947-61

Million 1951 Rubles	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961
Personnel	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000
Armored force vehicles	450	460	460	440	290	360	390	380	410	420	420	420	420	420	420
Weapons	460	460	460	460	470	480	480	490	500	500	510	520	520	530	530
POL a/	510	510	510	510	510	510	510	550	550	550	550	550	550	550	550
Vehicles	1,000	1,100	1,100	1,100	1,200	1,200	1,200	1,200	1,300	1,300	1,300	1,400	1,400	1,400	1,400
Support	900	980	980	1,100	1,100	1,300	1,300	1,300	1,300	1,300	1,200	1,200	1,300	1,300	1,300
Total	30,000	30,000	30,000	30,000	30,000	31,000	31,000	31,000	31,000	31,000	31,000	31,000	31,000	31,000	31,000
Operating expenditures per Line Division	170	170	170	170	170	180	180	180	180	180	180	180	180	180	180

a. Petroleum, oil, and lubricants.

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Table 9

Budgeted Operating Expenditures for the Naval Forces of the USSR, 1947-61

Million 1951 Rubles	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961
POB/ Operating spares	470	550	590	650	710	890	990	1,100	1,200	1,300	1,500	1,600	1,700	1,800	1,900
Personnel	230	260	280	360	390	440	530	590	670	780	910	1,000	1,100	1,200	1,300
Motor vehicles	3,600	3,600	3,600	3,600	4,400	4,400	4,400	4,600	4,700	5,100	5,400	5,700	5,900	6,200	6,500
Total	77	77	77	77	86	86	86	88	89	93	96	98	100	100	110
Operating expenditures per SDT ^b (in rubles)	4,400	4,500	4,600	4,700	5,600	5,900	6,000	6,400	6,700	7,300	7,900	8,400	8,800	9,300	9,800
POB a/ Operating spares	6,900	6,100	5,700	4,500	4,800	4,600	3,900	3,600	3,400	3,400	3,300	3,200	3,200	3,200	3,100
Personnel	740	740	740	610	610	690	630	620	610	620	630	630	620	620	620
	360	360	350	340	330	340	340	330	340	360	380	390	400	410	420
	5,600	4,400	4,500	3,400	3,800	3,500	2,800	2,600	2,400	2,400	2,300	2,200	2,100	2,100	2,100

a. Petroleum, oil, and lubricants.

b. Standard displacement ton.

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Table 10

Budgeted Operating Expenditures for the Air Forces of the USSR, 1947-61

Million 1951 Rubles	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961
Personnel	9,000	9,800	9,900	9,900	10,000	11,000	12,000	12,000	13,000	14,000	14,000	15,000	15,000	15,000	15,000
POI a/	710	770	820	950	1,200	1,600	2,100	2,300	2,400	3,400	4,200	4,700	5,200	5,300	5,400
Vehicles	180	180	180	190	200	210	230	250	250	260	260	260	260	270	270
Support	520	520	520	530	550	580	620	640	640	650	660	660	670	680	680
Training	280	280	560	700	700	700	700	780	870	1,000	1,000	1,300	1,300	1,000	1,000
Spares	480	630	910	1,000	1,400	1,600	1,900	2,400	2,700	3,400	3,900	4,700	5,700	6,500	6,900
Total	11,000	12,000	13,000	13,000	14,000	15,000	17,000	19,000	20,000	23,000	24,000	26,000	28,000	29,000	29,000
Operating Expenditures per															
Regiment	35	37	33	28	29	29	30	32	34	39	41	44	47	48	49
Personnel	28	30	25	21	21	20	21	21	22	24	24	25	25	25	25
POI*	2.2	2.3	2.1	2.1	2.0	2.4	3.0	3.7	4.0	4.2	5.8	7.1	7.9	8.8	9.1
Spares	1.5	1.9	2.3	2.3	2.2	2.8	3.0	3.4	4.2	4.7	6.6	8.0	9.6	11	12

a. Petroleum, oil, and lubricants.

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of personnel training in preparation for the increases in air OB in later years and because of a larger number of aircraft per regiment. After 1950 the increasingly higher fuel consumption of the growing number of jet aircraft was undoubtedly the factor at work in the high rate of increase in POL expenditures per regiment. The large percentage increase in the expenditures for operating spares per regiment shows most clearly the influence of the increasing complexity of the newer aircraft.

D. Sectors of Origin

To provide trends in the relation of military requirements to the whole economy, Soviet expenditures for weapons and weapon systems were classified in such a manner as to reflect the various sectors of origin of the expenditures. Table 11* shows the estimated budgeted military expenditures recast in terms of select economic categories.

Over the period, procurement from heavy industry shows the steepest upward trend. In 1947, this sector accounted for 21 billion rubles or 29 percent of the total. By 1955, the expenditures of this sector had increased by 222 percent to 69 billion rubles, or 54 percent of the total. By 1961, these expenditures had increased another 57 percent to 108 billion rubles or 60 percent of the total. Other procurement and wages during the full period (1947-61) increased only 36 percent. The pattern of this changing relationship which follows the trend towards the intensification of equipment in the Soviet military establishment is presented graphically in Figure 5.*

The trends in industrial origin within the heavy industry sector vary considerably as can be seen in Table 11.** The rates of increase are greatest in directly procured electronic equipment (principally ground radar), guided missiles, shipbuilding, and aircraft.

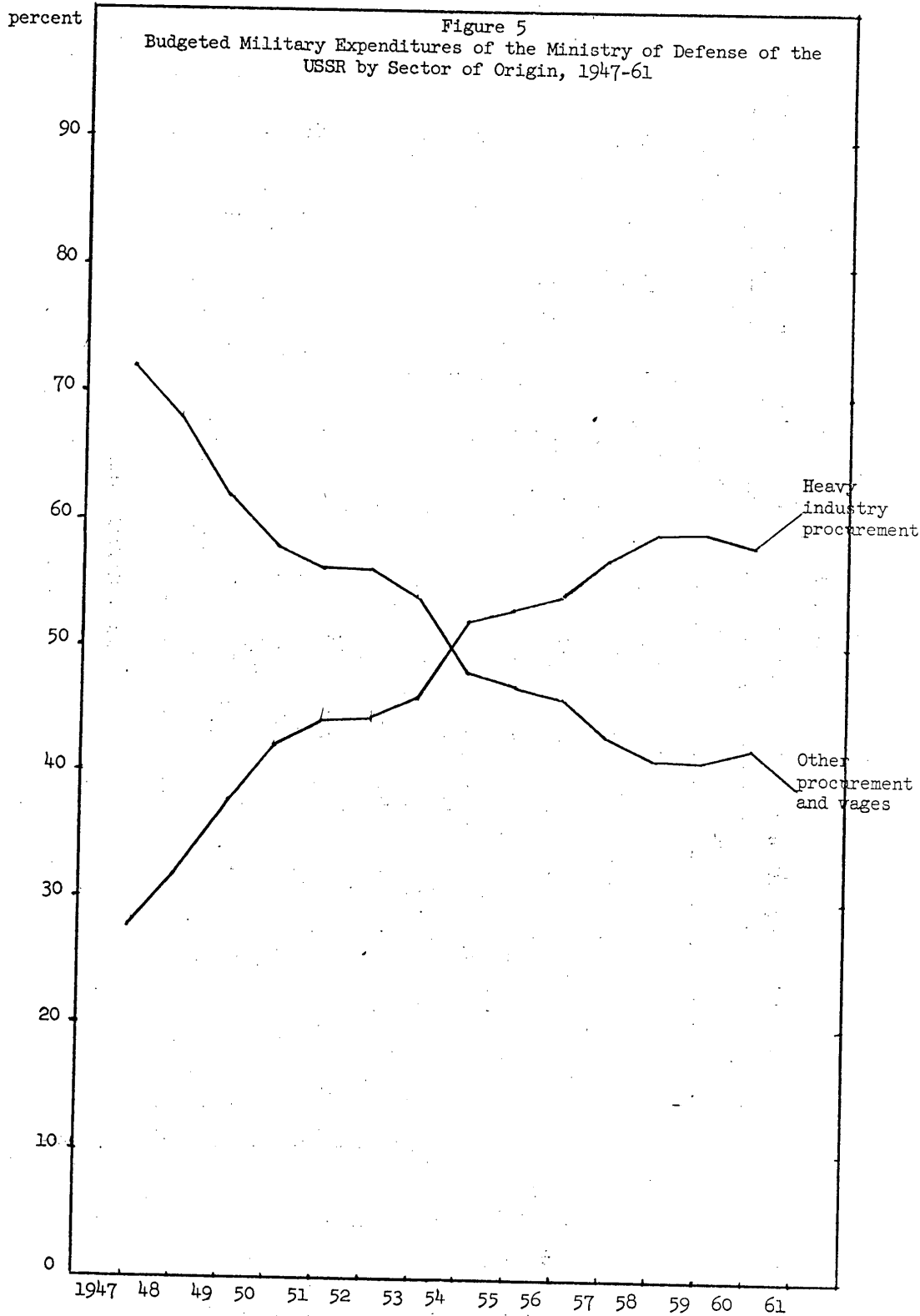
Wage payments and other types of procurement show a modest overall

* Figure 5 follows on page 50.

** Table 11 follows on page 51.

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Table 11

Budgeted Military Expenditures of the Ministry of Defense of the USSR by Sector of Origin, 1947-61

Billion 1951 Rubles	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961
Heavy industry sector	21	26	33	41	48	48	51	58	69	76	86	94	94	100	110
-Armored force vehicles	3.8	3.2	4.0	3.6	3.1	3.4	3.3	3.2	3.1	3.4	3.5	3.1	3.2	3.1	3.2
-Weapons	3.0	3.2	3.2	3.4	3.6	3.9	4.2	4.2	4.2	3.8	3.9	3.5	3.4	3.4	3.4
-Ammunition	1.2	2.4	2.8	3.2	4.4	5.4	5.2	5.0	4.8	5.2	4.2	5.2	5.2	5.2	5.2
-Aircraft	6.5	8.7	9.4	13	18	17	16	18	24	28	38	43	38	45	51
-Shipbuilding	0.1	0.2	0.3	1.1	1.7	2.2	2.5	13	15	15	16	13	13	14	14
-Electronic equipment	-	-	-	-	-	-	0.2	2.6	3.1	4.0	3.3	2.7	2.6	2.3	2.4
-Guided missiles	2.5	2.7	2.8	3.0	3.0	2.9	3.2	2.1	4.5	5.8	4.9	11	15	18	16
-Automotive equipment	1.7	1.8	1.9	2.1	2.4	3.0	3.6	3.5	3.2	2.9	2.9	3.2	3.2	3.3	3.3
-Petroleum	1.1	1.3	1.7	2.0	2.2	2.4	2.6	4.0	4.2	5.3	6.2	6.8	7.5	7.7	7.9
Equipment, not elsewhere classified	53	54	55	56	58	60	62	63	64	66	67	68	69	70	72
Other sectors	17	18	18	18	18	18	19	19	19	20	20	20	20	20	20
Food	3.9	3.9	3.9	3.9	4.0	4.1	4.1	4.2	4.2	4.3	4.4	4.4	4.4	4.5	4.5
Clothing	4.1	4.2	4.6	4.9	5.1	5.3	5.4	5.6	5.8	6.2	6.3	6.6	6.8	6.8	6.9
Miscellaneous materials and supplies	0.6	0.6	0.7	0.7	1.0	1.0	1.0	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Transportation	2.9	2.9	3.0	3.0	3.1	3.1	3.7	4.0	3.9	3.9	3.8	3.7	3.7	4.2	5.6
Construction	0.6	0.7	0.6	0.7	0.7	1.4	1.4	1.5	1.6	1.6	1.7	1.6	1.7	1.7	1.7
Communications	19	20	20	20	21	21	22	22	23	24	24	24	25	25	25
Military wages	2.8	2.8	2.8	2.8	2.9	2.9	3.0	3.0	3.0	3.1	3.1	3.1	3.2	3.2	3.2
Civilian wages	1.1	1.5	2.0	2.2	2.3	2.4	2.6	2.7	2.9	3.0	3.2	3.3	3.5	3.6	3.7
Pensions	74	80	88	97	110	110	110	120	130	140	150	160	160	170	180
Total															

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increase for the period. In 1947, this group accounted for 53 billion rubles whereas by 1955 it had increased only 21 percent to 64 billion rubles and by 1961 only an additional 12 percent to 72 billion rubles. Within these sectors the more noteworthy rates of increase are to be found in the construction and communication industries and in pension payments.

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IV. Military Assistance

Before the estimated Soviet military expenditures derived in III, above, may be compared with various historical aggregates the problem of trade in major military equipment must be faced. A complete detailed study of the trade problem was infeasible within the time available. Accordingly the problem was approached only in sufficient detail to gain as firm an approximation as possible of the effect this factor might have on the comparability of the series derived in III, above, with the announced budget series and estimates of gross national product (GNP).

So far as can be ascertained, in the normal sense of the term, the USSR imported no major military equipment during the period 1947-55. There is, however, the question of unilateral transfers in the form of occupation costs. The announced costs of Soviet occupation to East Germany, where the bulk of the occupation forces are stationed, has been as follows:

1949	2.18 billion DME*	3.92 billion rubles
1950	1.99	3.58
1951	1.95	3.51
1952	1.95	3.51
1953	1.95	3.51
1954	1.60	2.88
1955	1.60	2.88

The ruble values indicated were obtained by converting at the official rate of exchange. In terms of purchasing power, however, the payments may represent an appreciably greater ruble value. Therefore, it is possible that the East German economy has regularly borne the equivalent of between one-half and all the "real" operating costs of the Soviet occupation forces.

In the absence of evidence to the contrary, the presumption is that occupation costs, like reparations, are treated as receipts in the Soviet budget and national accounts. It is clear that, at minimum, the Soviet

* East German marks, converted at the official exchange rate of 1.8 rubles per DME.

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defense budget and national accounts include that part of these costs which cover payments for the sizable purchases of material procured inside the USSR for these occupation forces.

Soviet exports of major equipment are a somewhat more important matter. Generally the transfers from the USSR to other countries consisted of either war booty or older equipment. ¹⁾In the first instance the cost was probably negligible to the USSR. ²⁾In the second instance the equipment represented legitimate defense expenditures of the USSR when produced and was included in the announced defense expenditures; there probably was no later recovery to the defense budget.

Several important exceptions, however, must be considered. All of these exceptions relate to possible direct shipments of major equipment out of current production. The derived series shown in III, above, includes all Soviet major equipment production as a part of the estimated defense expenditures. For comparisons with the announced defense expenditures the problem, then, is whether or not Soviet budgetary practice follows the simple logical procedure of paying for all current major equipment production through the defense budget and of crediting any receipts from foreign transfers to the general revenues. For comparisons with Soviet GNP estimates, the problem is whether or not the amount of this trade is sufficient to affect, to any significant extent, the proportion of GNP devoted to defense.

Although the question of Soviet budgetary practice in regard to military equipment which moves in trade cannot be answered as yet, opinion tends toward the notion that all major equipment is paid for in the defense budget even though the plan calls for the shipment of current output to other countries. In effect the Minister of Defense is thought to be the sole purchaser of special military equipment. Because there may have been other purchasers, however, an attempt was made to estimate the value of shipments from current output. ¹⁾First, it was assumed that transfers of the Fagot (MIG-15) and the Beagle (Il-28) would be the best

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indication of the value which shipments from current output might have attained. How many of these aircraft were new when transferred is not known. A large part of the value of all transfers, however, would be represented by these two models, and these aircraft are more likely to have come from current production than any of the other major equipment items.⁷⁾ Secondly, it was assumed that all transfers to Communist China and North Korea were supported directly by the Soviet Defense Budget prior to 1953.*

OB information was available to provide an indication of the quantity and timing of the transfers. It would appear that the European Satellites received from the USSR some 300 Fagots in 1951-53 and some 100 Beagles between 1952 and 1955. Similarly, indications are that the Chinese Communists and the North Koreans received some 800 Fagots and 400 Beagles between 1953 and 1955. Taken together, the annual transfer by the USSR of new equipment which might not have been covered by the Soviet Defense Budget would have the following values:

1951	80 million rubles
1952	250 " "
1953	650 " "
1954	660 " "
1955	725 " "

The foregoing calculations would seem to indicate that it might be reasonable to ignore the value of trade for the period of this estimate.

The value of trade is less than 1 percent of the over-all level of the Defense Budget in recent years--a figure well within the margin of error of this estimate--hence; omission of the value of trade will do no real violence to the comparisons up to 1955, as noted in this report. Although the problem of the value of trade will have to be watched carefully in the future, it was not possible as of the date of the writing of this report to make meaningful estimates of the value of trade to cover the period of the projection (1956-61).

* Known purchases through the Soviet Engineering Directorate on barter account amounted to 100 million rubles in 1950, 300 million rubles in 1951, 400 million rubles in 1952, 1,100 million rubles in 1953, and 500 million rubles in 1954. In addition the Chinese are thought to have received a military loan in excess of 4 billion rubles for their First Five Year Plan period (1953-57). A considerable part of this loan is thought to reflect the transfer of Soviet military equipment and facilities at Port Arthur and Dairen.

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V. Summary

A. General

The derived Soviet military expenditures in III, above, provides the basis for comparison with the Soviet announced Defense Budget for 1947-56, with the Soviet GNP, and with the actual or estimated US defense expenditures for 1947-57.

B. Trends in Total* Defense Costs

Table 12 shows the summation of the budgeted and nonbudgeted Soviet

Table 12

Defense Expenditures of the USSR, 1947-61
Billion 1951 Rubles

Year	Budgeted expenditures	Nonbudgeted expenditures	Total expenditures a/
1947	74	22	95
1948	80	23	100
1949	88	23	110
1950	97	26	120
1951	110	27	130
1952	110	29	140
1953	110	29	140
1954	120	31	150
1955	130	35	170
1956	140	39	180
1957	150	41	190
1958	160	42	200
1959	160	45	200
1960	170	47	220
1961	180	50	230

a. Components may not add to totals because of rounding.

military expenditures.** These "total" expenditures range from 95 billion 1951 rubles in 1947 to 230 billion 1951 rubles in 1961, with expenditures in 1955 at 168 billion rubles. The budgeted military expenditures constitute between 75 and 80 percent of this total.

C. Comparison of Derived Budgeted Defense Expenditures with the
Announced Soviet Defense Budget

In order to compare the derived budgeted defense expenditures with the

* Excludes some construction and possibly some overhead costs and subsidies.

** That is, those expenditures budgeted to the Ministry of Defense and those expenditures not budgeted to the Ministry of Defense.

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announced Soviet Defense Budget, it was necessary to adjust the derived constant ruble series for price changes over time. It was not necessary to adjust the estimates for pay and allowances, because the rates for pay and allowances were constant for the period. Reasonably good price indexes were available for subsistence items. The other costs refer largely to hard goods and were converted to current rubles by means of an adjusted price index for capital equipment and construction. Although the precise applicability of this index is subject to some question, fragmentary evidence suggests that prices of military end items did not rise as much as other industrial prices before 1951 and did not fall as much after 1951. Thus the investment price index errs most probably in moving the derived series too close to the announced budget series in the early and late years.

In Figure 6* the derived budgeted defense series (in current rubles) is compared graphically with the explicit defense expenditures as announced in the Soviet State Budget. The graph shows that estimated military expenditures increased about 30 percent from a low of 78 billion rubles in 1947 to a plateau at about 100 billion rubles between 1949 and 1953 and then increased by 23 percent from 101 billion rubles to 124 billion rubles between 1953 and 1956. By contrast the explicit budget indicates an expenditure plateau at slightly more than 65 billion rubles in 1947 and 1948. Then came a rise of 63 percent to 109 billion rubles in 1952, followed by an 8 percent decline to 100 billion rubles in 1954. In 1955 the planned budget increased again by 12 percent to 112 billion rubles, then declined by 9 percent to 102 billion rubles in 1956. In all except the last three years the announced budget series refers to actual expenditures. Because planned expenditures frequently vary from actual expenditures by several billion rubles, some misstatement of actual expenditures is possible in 1954, 1955, and 1956.

* See following page.

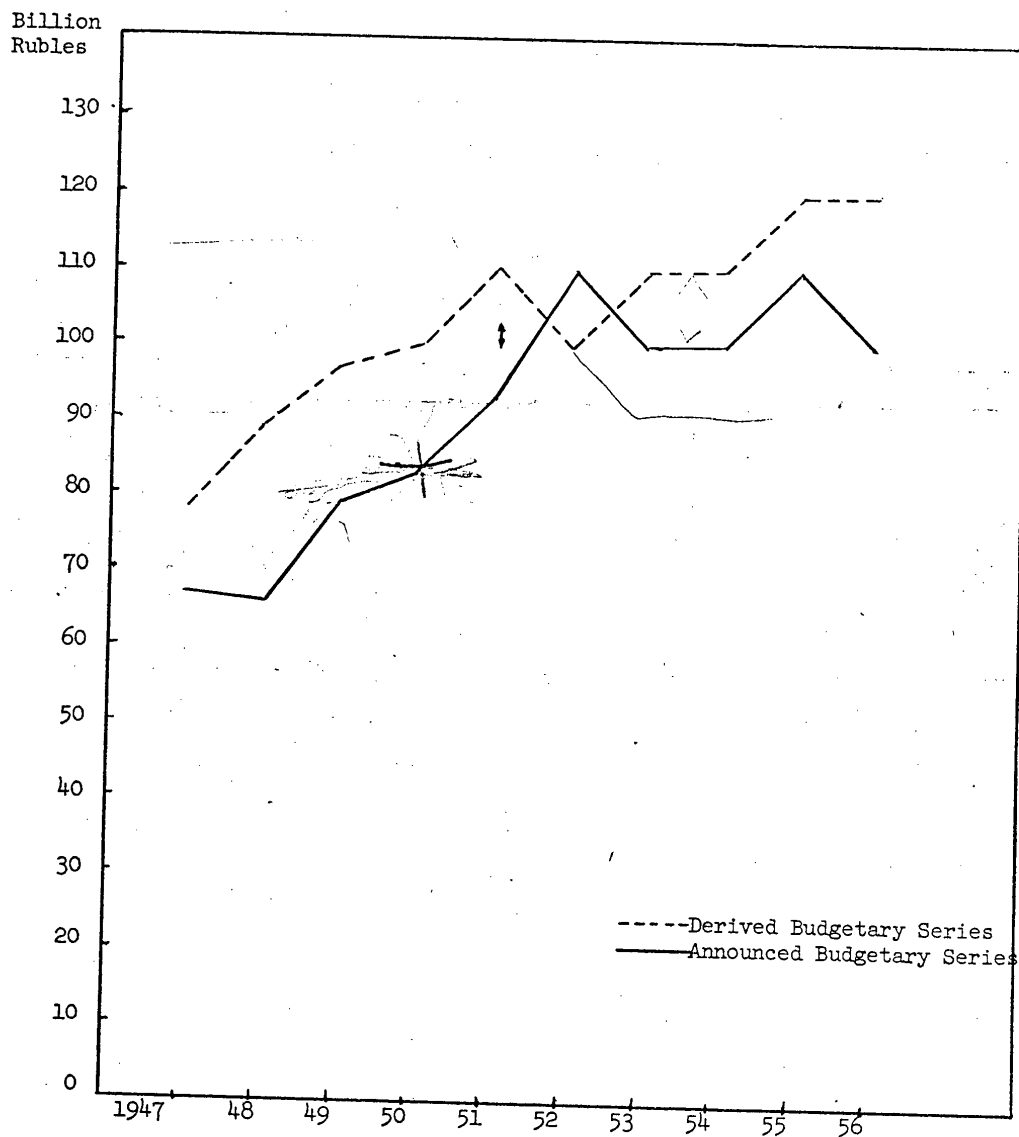
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Figure 6

Budgeted Military Expenditures in the USSR, 1947-56*

(Billion Current Rubles)



* In the announced budgetary series, 1954, 1955, and 1956 were plan figures.

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As can be seen in Table 13, the derived budgeted series overstates the announced expenditures in the aggregate. The overstatement also applies to every year but 1952. The cumulative expenditures for 1947 through 1956 are 916 billion rubles as announced and 1,033 billion as derived on a current basis, an over-explanation of 13 percent on the average. Actually the variance would be greater if it were possible to offset the understatement implied in the necessarily conservative estimates made in such significant categories as personnel pay and allowances, food, construction, and transportation. In the year 1951, which is the base year and consequently free of the problem of price

Table 13

Budgeted Defense Expenditures in the USSR, 1947-56
(Billion Current Rubles)

Year	Derived Series	Announced Series ^{a/}
1947	78	67
1948	89	66
1949	97	79
1950	102	83
1951	106	93
1952	101	109
1953	106	105
1954	111	100
1955	119	112
1956	124	102
Σ. 1954, 1955, and 1956 are plan figures.		98

indexes, the explicit budgetary expenditure for the Soviet military was 93 billion rubles and the derived expenditure, 106 billion rubles, a difference of 14 percent.

Of the three periods distinguished in Table 13, the first, 1947-49, accounts for 44 percent of the total variance. In 1948 the overstatement is at its greatest, 23 billion rubles. The relationship between the estimated military outlays and the announced outlays, along with other evidence suggests that the postwar cutback was deeper and extended over a longer period than previously estimated.

In the second period, 1950-53, the pattern of variation is quite erratic although there is only a 6 percent total difference between the

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two series over these years. This comparison suggests that the estimates of OB and procurement underlying the derived series are too flat. That is, the derived expenditures closely reflect the Soviet military expenditures covered by the explicit budgetary appropriation for the period 1950-53, but the phasing of the estimates is not very sensitive to changes in Soviet procurement and/or mobilization. (Because the base year (1951) centers in this period and because price movements, in general, were moderate, beginning in 1950 the price index contributes a minimum of distortion during this period.)

The discrepancies noted above warrant the closest scrutiny because in 1952 the derived series understates the explicit budget. The series cross and recross as is indicated graphically in Figure 6.* In this year (1952), there was a sharp increase in Soviet explicit military appropriations as opposed to the modest decline in the estimate of budgeted military expenditures. There are numerous possible explanations for this difference. ¹⁾The most cogent seems to rest on the fact that these expenditures occurred during the Korean War period. Because the USSR presumably has its military programs on a long range basis, it seems reasonable that such plans would be upset by the heavier-than-expected demands of the Korean War. This increased demand probably necessitated, from the Soviet point of view, a spurt in military production and procurement at least to replace certain types of transferred equipment and to replenish reserve stocks. Certain facts suggest that such a spurt in military production and procurement might have taken place. In 1951, Soviet production of certain categories of heavy fabricated metal goods underwent a sharp decline, which continued in some instances into 1952, while the production of basic metals continued to increase. Recovery was only slight prior to 1953, at which time 1950 production levels were generally regained. Tractor, truck, passenger car, steam locomotive, and freight car production are items indicated to have suffered a decline

* See page 58.

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in production.

^) There is also the possibility of a partial mobilization at the time of the Korean War. The evidence is far from conclusive, but so-called "strategic" expenditures, which insofar as they pertain to the military establishment are mainly for the payment of wages, increased in the Far East in 1952, indicating that Soviet military strength in this area may have been reinforced. This increase in strategic expenditures was followed by a general pattern of decline in 1953 for these same expenditures. Prior to mid-1953 (the end of the Korean War) there was some decline, but the decline seems to have been sharper and more general in the latter part of the year. [] makes the foregoing evidence of a partial mobilization inconclusive because a similar pattern could have resulted from a redistribution of troops, first to, then from, the Soviet Far East.

>) A third possibility which has been offered as a logical explanation of the sharp rise in military expenditures in 1952 is that this rise may have been caused by particularly intensive research and development activity, possibly associated with the guided missiles, the medium jet bomber, and/or the heavy bombers which appeared in the period from 1953 to 1955. Seemingly positive evidence, however, would indicate that neither research nor development expenditures are supported by the military budget directly or in the price of equipment. It is pretty well established that the bulk of pure research facilities are supported out of funds allocated directly to the Soviet Academy of Sciences. Development expenditures in turn are carefully distinguished from subsidies. In a discussion of subsidies, a quasi-official publication states that, in contrast to state subsidies to heavy industries which must be eliminated under the "new condition", the "principle... of centralized reimbursement of the added expenses of enterprises connected with the assimilation of new forms of production retains its meaning into the present (1953) time".

In the last 3 years, 1954-56, the amount of overstatement increases

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again. As indicated in Table 13*, the derived series for 1954-56 combined (354 billion rubles) exceeds the announced budget series (314 billion rubles) by 13 percent as compared to the 6 percent overstatement in the 1950-53 period. The data, as indicated graphically in Figure 6,** display an irregular, but divergent, movement between 1954 and 1956.

D. Comparison with Gross National Product

In order to make total defense expenditures comparable with gross national product, three adjustments are necessary.¹⁾ The series in Table 12^{***} first must be converted to 1953 rubles,²⁾ then converted to factor prices, and³⁾ finally adjusted for the change in relative prices over the period. The last adjustment is derived from US experience. It was necessary to express the derived series in terms of constant factor prices in order to determine what part of the Soviet total product was being devoted to military programs. Tables 14**** and 15**** present this adjusted series in 1953 rubles and 1955 dollars respectively, and give the relationship between total***** military expenditures and GNP. In ruble terms, military expenditures average 14 percent of GNP annually between 1948 and 1961.

Of note is the fact that for the 14 year period extending from 1948 to 1961 Soviet military expenditures have fluctuated rather narrowly around an annual figure of 14 percent of GNP. These percentages are based on the price series depicted in Table 14 and express the military allocation in Soviet terms. The relative stability in the ruble-based series implies that the growth in Soviet military expenditures is at the same rapid pace as that of the economy as a whole and suggests that there even may be some design in this relationship.

It would seem for the 1956-61 period as a whole that the military

* Page 59, above.

** Page 58, above.

*** Page 56, above.

**** Tables 14 and 15 follow on page 63.

***** Excludes some construction, and possibly some overhead costs and subsidies.

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Table 14
Soviet Defense Expenditures and Gross National Product a/, 1947-61
In Constant Factor Prices
(Billion 1953 Rubles)

Year	Expenditures	GNP	Expenditures as a Percentage of GNP
1947	85	-	-
1948	92	620	15
1949	100	690	14
1950	110	770	14
1951	120	840	14
1952	120	900	14
1953	130	940	14
1954	140	1,000	13
1955	150	1,100	14
1956	160	1,200	14
1957	170	1,300	14
1958	180	1,400	14
1959	190	1,500	13
1960	200	1,500	13
1961	210	1,600	13

a. GNP

Table 15
Soviet Defense Expenditures and Gross National Product a/, 1947-61
In Constant Market Prices
(Billion 1955 Dollars)

Year	Expenditures	GNP	Expenditures as a Percentage of GNP
1947	24	-	-
1948	26	83	31
1949	27	91	30
1950	29	100	28
1951	31	110	28
1952	31	120	26
1953	33	120	26
1954	35	140	26
1955	37	140	26
1956	40	160	26
1957	41	170	25
1958	43	180	24
1959	44	190	23
1960	46	200	23
1961	48	220	22

a. GNP

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expenditures projected here are, in the aggregate, within Soviet economic capabilities. The proportion is not larger than it was when GNP was considerably smaller and, in fact, could be increased at the expense of other sectors of the economy if the regime chose to do so without precluding some increase in the standard of living.

Table 15* shows that the general relationship obtained for the historical series maintains itself during the projection period also when expressed in dollar terms. Total military expenditures, as defined, account for from 31 percent of total goods and services in 1948 to 22 percent in 1961. The decline in percentages based on the dollar comparison reflects, in part at least, the increasing proportion of higher ruble-dollar ratio equipment in the Soviet military establishment.

The ruble measurements reflect the fundamental orientation of Soviet economic goals in the direction of strong military and investment programs. The result is that military goods are relatively cheap within the Soviet economy, and consumer goods are relatively dear by reason of price decisions and other economic policies (especially the high turnover taxes on consumption items). In the US economy, on the other hand, consumer sovereignty results in precisely the inverse relationship. Thus, as a percentage of Soviet GNP, the military sector expressed in rubles is relatively small, whereas in dollars it is considerably larger. Illustrative of these relative costs are the ruble-dollar ratios for the two sectors. For military goods and services the 1953 ruble-1955 dollar ratio with 1953 weights is about 4 to 1, whereas for the consumption sector as a whole it is 11 to 1.

That the USSR, by expending some 14 percent of GNP, in rubles can obtain defense goods and services approximately equal in dollar value to those of the US, which is expending about the same percent of a GNP $2\frac{1}{2}$ times as large, is explained by 2 important economic conditions.

1) First the level of real pay and subsistence provided to Soviet soldiers,

* Page 63, above.

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like the general standards of living, is very much lower than in the US.

2) Secondly the Soviet armament industry is one of that country's most efficient. The dollar and ruble comparisons above do not mean that the Soviet armament industry is more efficient than the US armament industry. On the contrary, it is likely that productivity (production per man) in the Soviet armament industry is lower than productivity in the US industry. The Soviet armament industry, however, is very much more efficient than Soviet agriculture and other consumer goods industries. Although productivity in the Soviet armament industry approaches that of the US, productivity in Soviet agriculture is only one-seventh of that in the US. Consequently a ruble will buy less than ten cents worth of goods and services when spent for consumption goods and services but will purchase about 25 cents worth when spent for defense purposes. The reason an approximately equivalent defense establishment is no greater a burden on the much smaller Soviet economy than on the larger US economy lies more in the inefficiency of Soviet agriculture than in the efficiency of its armament industry. Thus, for example, if each industry transfers a worker from agriculture to the defense industry, the Soviet worker will produce nearly as many armaments as the American worker, but the loss of his production in agriculture is far less than the corresponding loss in the US. These effects of the relative inefficiency of Soviet agriculture and other consumption sectors are amplified by the turnover tax which makes the goods and services of these sectors even more expensive.

The major share of budgeted Soviet military expenditures (after 1954), as indicated in Table 11* represents goods produced in the heavy industry sector. Consequently, it is in this sector that economic bottlenecks, if they do occur, are likely to develop. By 1961, projected heavy industrial military procurement from heavy industry rises by more than 50 percent of its value in 1955. Industry, in general, increases 83 percent in this

* Page 50, above.

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period; and heavy industry, 89 percent. Of more relevance are the projected rates of increase of specific subsectors directly supporting the Soviet military effort. The rates of growth of output in those subsectors of critical significance are usually greater than in the heavy industry sector as a whole. The electronics industry is to increase by 227 percent over 1955; the metallforming industry, by 93 percent; automotive equipment, by 47 percent; POL, by 133 percent, and basic nonferrous and ferrous metals, by 105 and 62 percent, respectively. The Sixth Five Year Plan indicates that in various critical categories economic measures are to be taken to assure the capabilities to meet the anticipated industrial requirements. These categories include (1) instruments for automation, to be increased 3.5 times; (2) control and automatic regulating instruments, 4 times; (3) optical instruments, 3 times; (4) capacity for producing heat resisting alloys, 6 times; (5) radio measuring instruments, 3 times; and (6) computers and calculators, 4.5 times.

It is interesting to note that the growth of the demands on heavy industry by the military occurs in 2 steps with a plateau in 1958-59. It is possible that in the latter years the initiation of sizable outlays for high-speed nuclear submarines or similar advanced items may raise expenditures to a level somewhat higher than indicated here.

In 1958 the value of heavy industry procurement is 136 percent of its value in 1955, thereby exhibiting a growth rate of the same order as that indicated for the heavy industry sector as a whole. Three-quarters of the growth from 1955-58 is accounted for by the aircraft industry--some 19 billion of the 25 billion rubles. In terms of airframe weight there was an increase of 63 percent over the 3 year period and an increase of 115 percent in the period from 1954 to 1958. (See Figure 7*.) Such short run intensification may occasion some shifting within the economy.

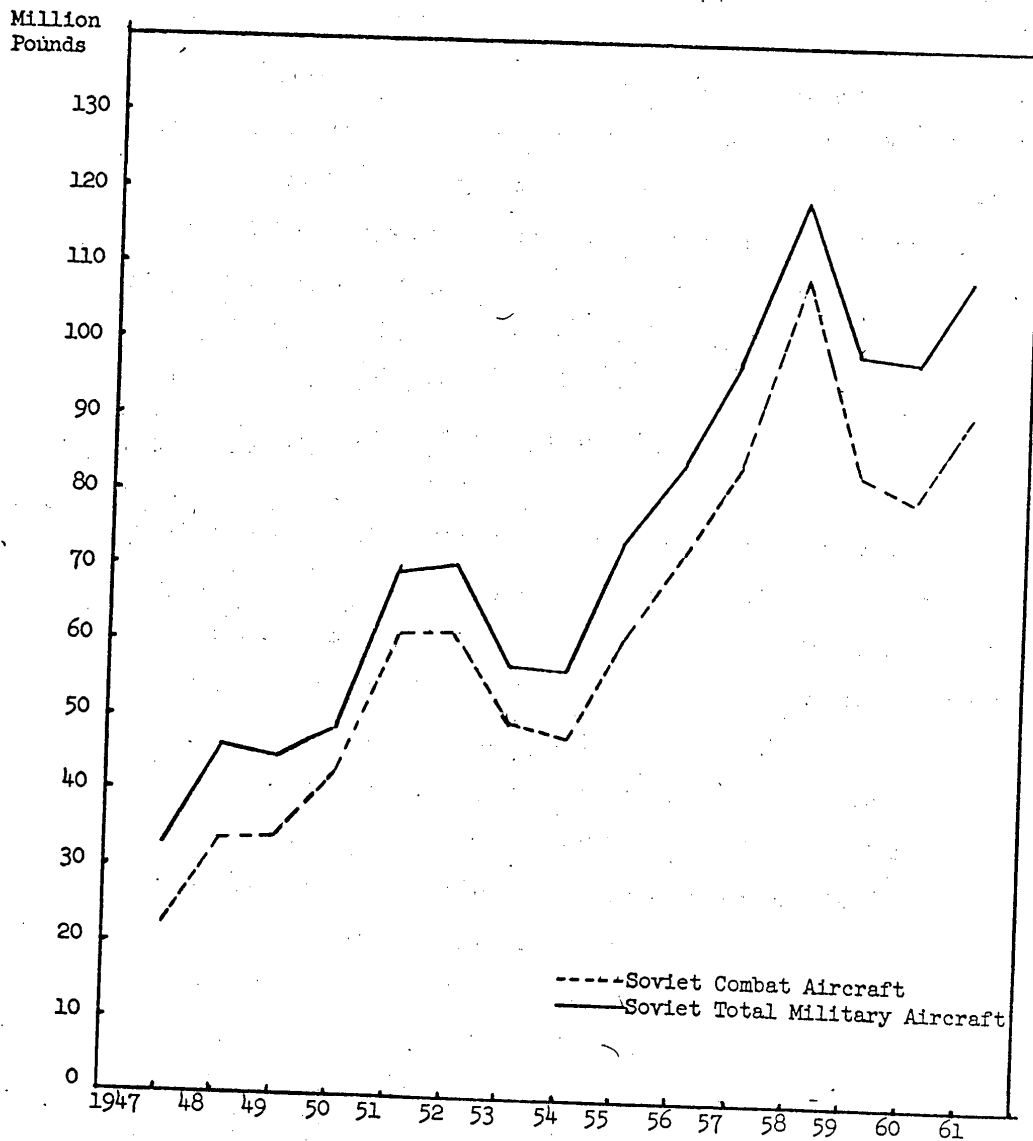
* Following on page 67.

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Figure 7

Soviet Production of Aircraft, in Airframe Weight, 1947-61



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